WATER QUALITY IN THE DELAWARE RIVER BASIN, NEW YORK

by
R. J. Archer and J. A. Shaughnessy
U. S. Geological Survey

Prepared by the
U. S. GEOLOGICAL SURVEY
in cooperation with the
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ABSTRACT

The chemical quality of water resources in the New York part of the Delaware River basin ranges from fair to excellent. Dissolved-solids content of surface waters averages about 37 ppm (parts per million), and is within the range from 20 to 76 ppm irrespective of season and location. Hardness of surface water is also quite low; the average is about 22 ppm (as calcium carbonate). In contrast, the dissolved-solids content of ground water is often much higher (maximum determined concentration was 491 ppm) than that of water in streams. Hardness of ground water is generally less than 70 ppm, but may exceed 100 ppm. Although the quality of surface water is rated as excellent and that of ground water only as fair to good, both sources of water are acceptable for most uses.

The quality of both surface and ground waters is the result of the action and interaction of several environmental

factors. Of these, one of the most important is the relatively impermeable and insoluble rock in the area. As a result, surface water dissolves only small quantities of mineral matter from the rocks.

Ground water is exposed to some of the same environmental conditions as surface water, but it generally has higher dissolved-solids content and is harder than surface water. However, the physical quality of ground water is generally better than that of surface water.

In contrast to ground water which is seldom turbid, surface water often contains suspended sediment. In the Delaware River basin, the concentrations of suspended sediment in streams are generally low. But during or after a heavy rain, suspended-sediment concentration (ppm) and load (tons per day) may be relatively high; on December 21, 1957, the Delaware River at Port Jervis transported about 69,500 tons of suspended sediment.

The uniformly low temperature of ground water generally makes it more suitable for cooling purposes than that of surface water. The temperature of water in most wells (30 or more feet deep) does not fluctuate seasonally, but remains

slightly above the annual mean air temperature (about 50°F at Port Jervis). Surface water, on the other hand, is closely related to air temperature; and the typical seasonal cyclic pattern is evident in the Delaware River basin.

INTRODUCTION

This report is one of a series of publications concerned with water quality in New York State. Water quality information is a necessary part of all studies of water resources. Although such information does not solve water problems, an interpretation of the data and a knowledge of hydrologic processes can contribute to the solution of water problems. The purpose of this report is to appraise the present water-quality situation and to look into the future.

The area studied is shown in figure 1. Because it borders on Pennsylvania and New Jersey, studies conducted in this area will contribute also to similar hydrologic studies conducted in those states.

The study in this and other areas throughout the State has been conducted in cooperation with the New York State Department of Commerce. Acknowledgment is extended especially to Keith S. McHugh, Commissioner; Ronald B. Peterson, Deputy Commissioner; and Henry Gallien, Jr., Director of the Bureau of Industrial Development. The study was supervised by F. H. Pauszek, district chemist, Quality of Water Branch, U. S. Geological Survey.

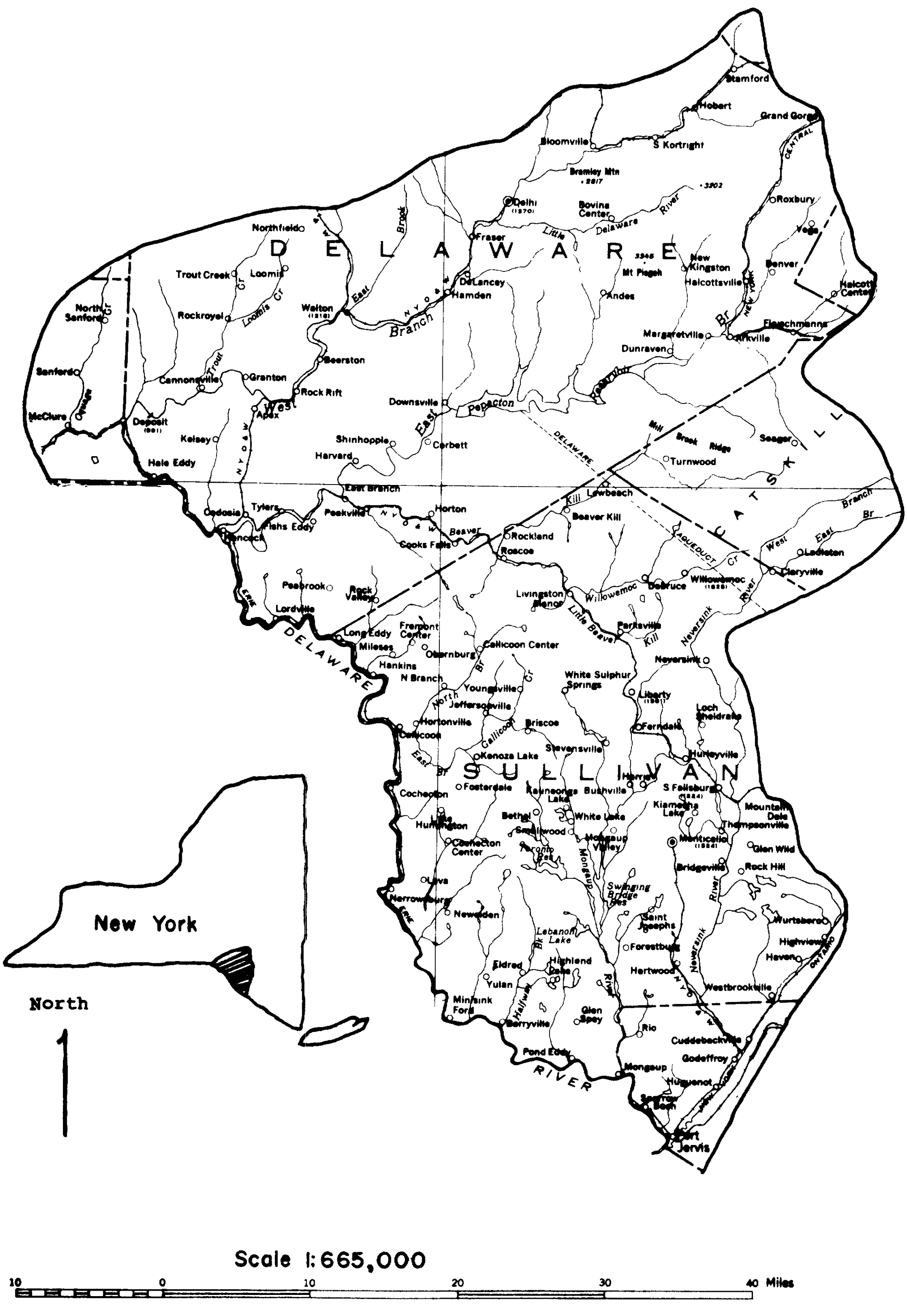


Figure 1.- New York part of the Delaware River Basin

THE PRESENT WATER-QUALITY SITUATION

Surface Water

Chemical Quality

The chemical quality of surface water in the Delaware River basin is excellent. Dissolved-solids content is low, averaging about 37 ppm, and the average hardness of water is about 22 ppm. Silica, calcium, bicarbonate, and sulfate are the chief dissolved constituents. They make up about three-quarters of the calculated dissolved solids. The average, maximum, and minimum values observed for each of these constituents, as well as those of other constituents and properties, are given in summary table 1. Complete data from which the summary was compiled are given in appendix tables 7 - 12.

Silica concentrations ranged from 0.6 to 11 ppm, but averaged only 3.2 ppm. The principal source of silica may be the glacial till which covers much of the study area. Weathering of the till may allow some of its silicate minerals to dissolve in the water passing over or through the till.

Calcium concentrations ranged from 4.2 to 13 ppm and averaged about 6.1 ppm. Some limestone is present in the area; and therefore, probably is an important local source of

Table 1. - Summary chemical analyses of streams in Delaware River basin

(Chemical constituents, dissolved solids, and hardness in parts per million. Analyses by Geological Survey, United States Department of the Interior.)

Based on 212 analyses of water from 30 sites

Constituent or property	Maximum[a]	Minimum	Average[b]
Silica (SiO_2)	11	0.6	3.2
Iron (Fe)	.38	.00	.07
Calcium (Ca)	13	4.2	6.1
Magnesium (Mg)	2.7	.3	1.4
Sodium (Na)	9.3	.4	2.0
Potassium (K)	2.2	.1	.8
Bicarbonate (HCO_3)	54	4	14
Carbonate (CO_3)	4	0	0
Sulfate (SO_4)	15	4.6	9.8
Chloride (Cl)	18	.3	2.7
Fluoride (F)	.4	.0	.1
Nitrate (NO_3)	3.9	.0	1.6
Dissolved solids			
Residue on evaporation at 180°C.	76	20	37
Hardness as $CaCO_3$	48	9	22
Noncarbonate hardness as $CaCO_3$	22	0	10
Specific conductance			
(micromhos at 25°C)[c]	139	28	57
pH[c]	8.9	5.8	--
Color	64	1	4

[a]Values for Delaware River at Port Jervis on February 21, 1958 are not included. High results on that day are believed to be unrepresentative.
[b]Obtained by averaging the average values at 30 different sites.
[c]Includes daily values.

calcium in the water. Of perhaps much greater importance as a source of calcium is calcium carbonate, which is present as a cementing agent in the sandstone and shales.

Bicarbonate concentrations ranged from 4 to 54 ppm and averaged 14 ppm. The sources of bicarbonate are closely associated with those which contribute calcium.

Sulfate concentrations were fairly consistent throughout the study area, ranging from 4.6 to 15 ppm and averaging 9.8 ppm. The source of these sulfates may be the marine shales or pyrites which occur in some areas of the basin.

The hardness of water is due to the calcium and magnesium in the water; and therefore, is directly related to these constituents as to source and variation.

Dissolved-solids content is the sum total of the individual constituents; therefore, a major change in the concentration of any constituent will be reflected in the dissolved solids. The dissolved solids fluctuated between 20 and 76 ppm, but were generally less than 60 ppm.

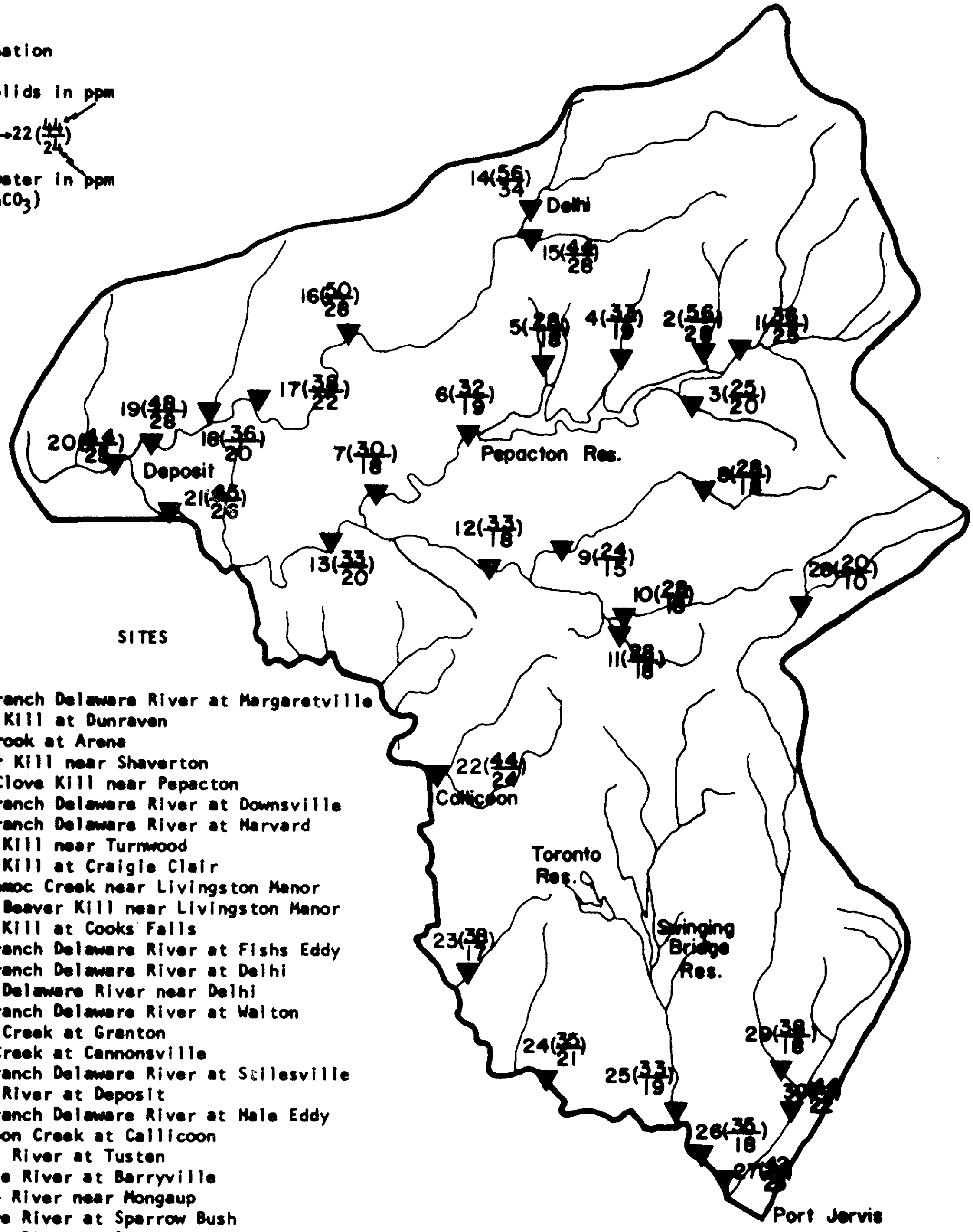
Areal variations in chemical quality are shown graphically in figure 2. Based on dissolved-solids content and hardness, it is apparent that the water quality of streams is excellent.

Explanation

Dissolved solids in ppm

Site number → 22($\frac{44}{24}$)

Hardness of water in ppm (as $CaCO_3$)



SITES

1. East Branch Delaware River at Margaretville
2. Platte Kill at Dunraven
3. Mill Brook at Arena
4. Tremper Kill near Shaverton
5. Terry Clove Kill near Pepacton
6. East Branch Delaware River at Downsville
7. East Branch Delaware River at Harvard
8. Beaver Kill near Turnwood
9. Beaver Kill at Craigie Clair
10. Willowemoc Creek near Livingston Manor
11. Little Beaver Kill near Livingston Manor
12. Beaver Kill at Cooks Falls
13. East Branch Delaware River at Fishs Eddy
14. West Branch Delaware River at Delhi
15. Little Delaware River near Delhi
16. West Branch Delaware River at Walton
17. Dryden Creek at Granton
18. Trout Creek at Cannonsville
19. West Branch Delaware River at Stilesville
20. Oquaga River at Deposit
21. West Branch Delaware River at Hale Eddy
22. Callicoon Creek at Callicoon
23. Tenmile River at Tusten
24. Delaware River at Barryville
25. Mongaup River near Mongaup
26. Delaware River at Sparrow Bush
27. Delaware River at Port Jervis
28. Neversink River at Claryville
29. Neversink River at Oakland Valley
30. Neversink River at Godeffroy

Scale 1:665,000

10 0 10 20 30 40 Miles

Figure 2. - Average hardness of water and dissolved-solids content of streams in the Delaware River basin.

in all parts of the basin. At Margaretville, the furthest upstream site, dissolved-solids content averaged 36 ppm. At the other end of the basin in New York (Port Jervis), dissolved-solids content averaged 42 ppm. The average hardness of water at both locations was 25 ppm.

Generally the dissolved-solids content is lower in streams of the East Branch Delaware River basin (sites 1 - 13) than in the remainder of the study area (fig. 2).

The ranges expressed by the maximum-minimum relations in table 1 are areal variations for the most part. Chemical quality at a point also varies with time. Generally, this is because of changes in the ratio between the surface-water runoff and ground-water runoff in the stream.

Although the dissolved solids of the ground water in this basin are low, they are commonly higher than those of surface water. During periods of little or no precipitation, it is possible that almost the entire streamflow may be composed of ground-water runoff; and it is during these periods that higher concentrations are commonly found. For example, in Platte Kill (fig. 2, site 2) on July 14, 1959, the discharge was 3.3 cfs (cubic feet per second) and the dissolved-solids

content was 76 ppm, while on April 12, 1960, the discharge was 98 cfs and the dissolved-solids content was 35 ppm. Other examples of change with discharge can be seen in figures 3 and 4.

Figures 3 and 4 relate daily specific conductance and daily mean discharge for the 1958 water year in the Delaware River at Port Jervis and in the Neversink River at Godeffroy, respectively. A table giving the approximate dissolved-solids equivalent of the specific conductance is shown in the upper left corner of each figure. These tables are derived from the equation developed by statistical analysis of the observed relationship between dissolved-solids content and specific conductance of samples from each location.

For the Delaware River at Port Jervis, the equation is:

Dissolved solids in ppm (approximate) = 4 + (0.622 x specific conductance in micromhos)

For the Neversink River at Godeffroy, the equation is:

Dissolved solids in ppm (approximate) = 7 + (0.578 x specific conductance in micromhos)

Figures 5 and 6 show these relationships graphically.

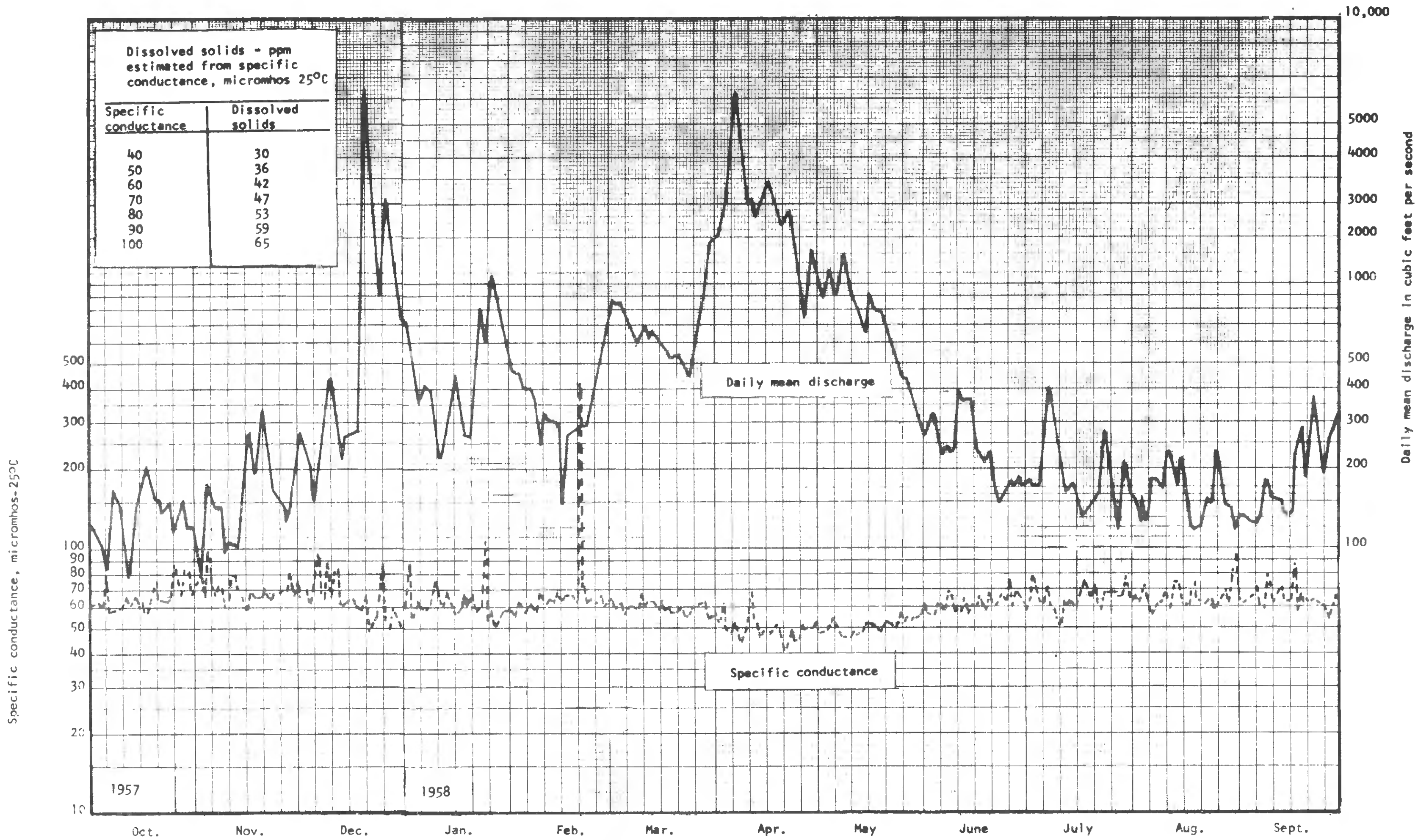


Figure 3. - Specific conductance and daily mean discharge of Delaware River at Port Jervis, 1958 water year

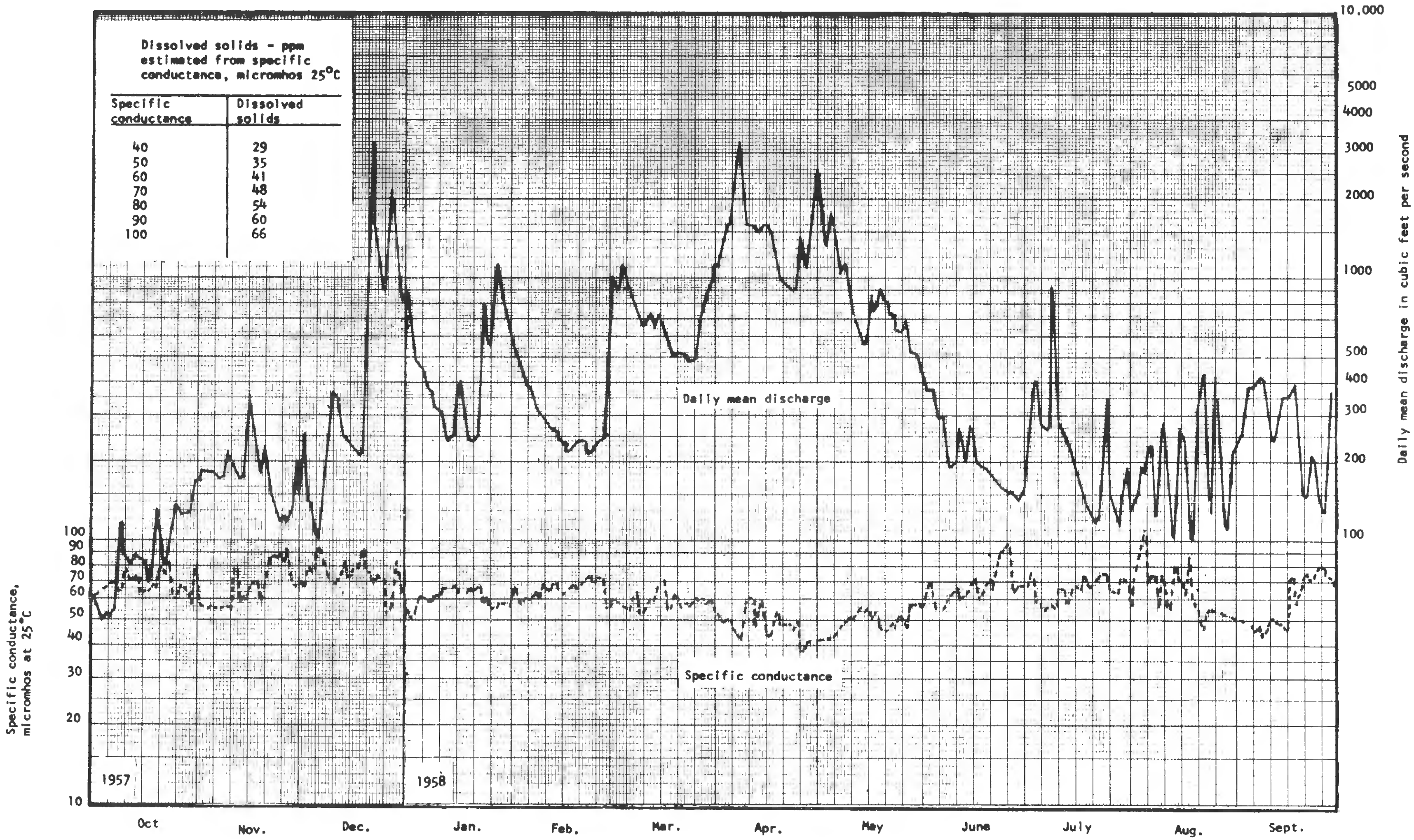


Figure 4. - Specific conductance and daily mean discharge of Neversink River at Godeffroy, 1958 water year

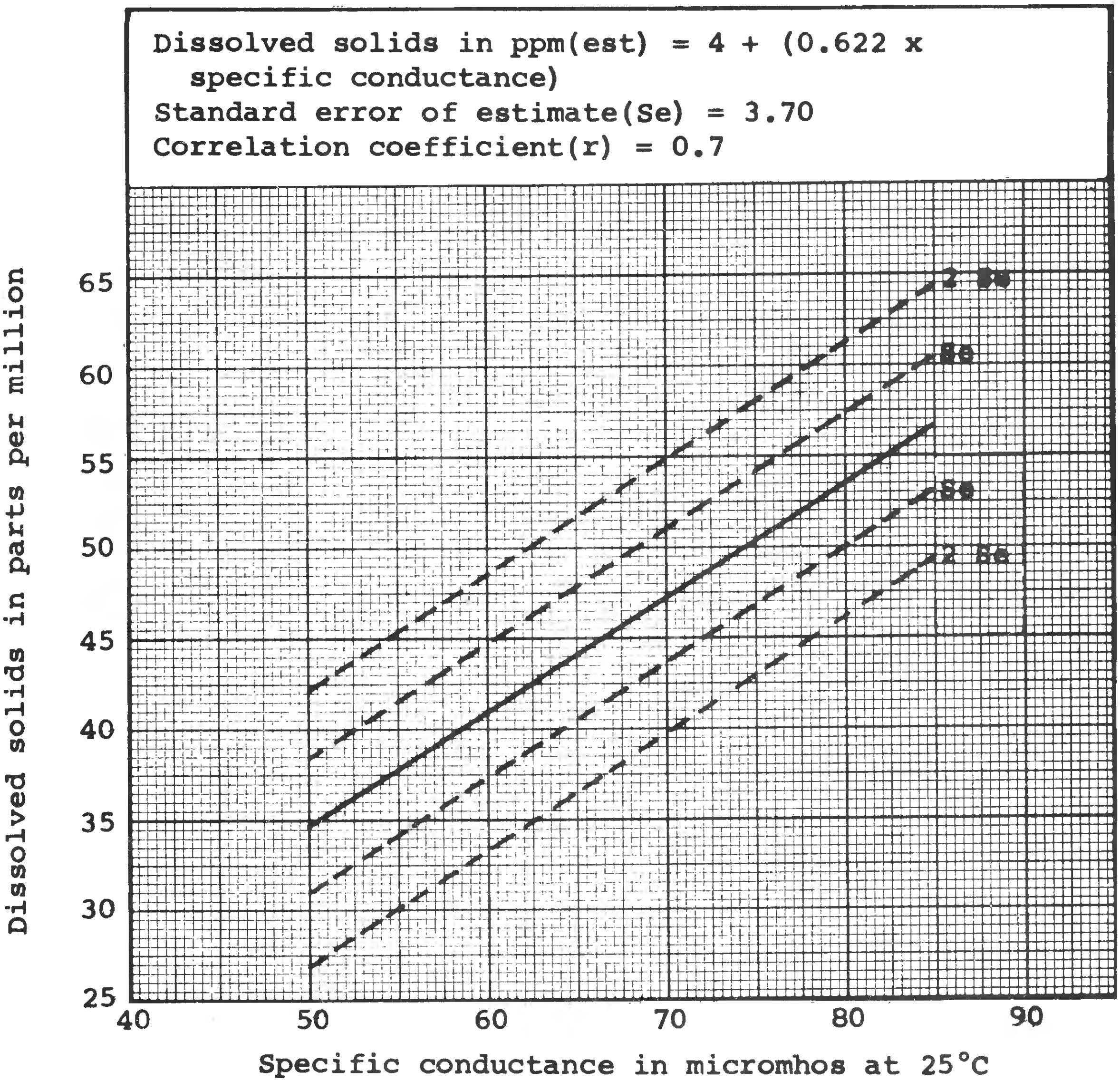


Figure 5. - Dissolved solids and specific conductance, Delaware River at Port Jervis, 1958 and 1959 water years.

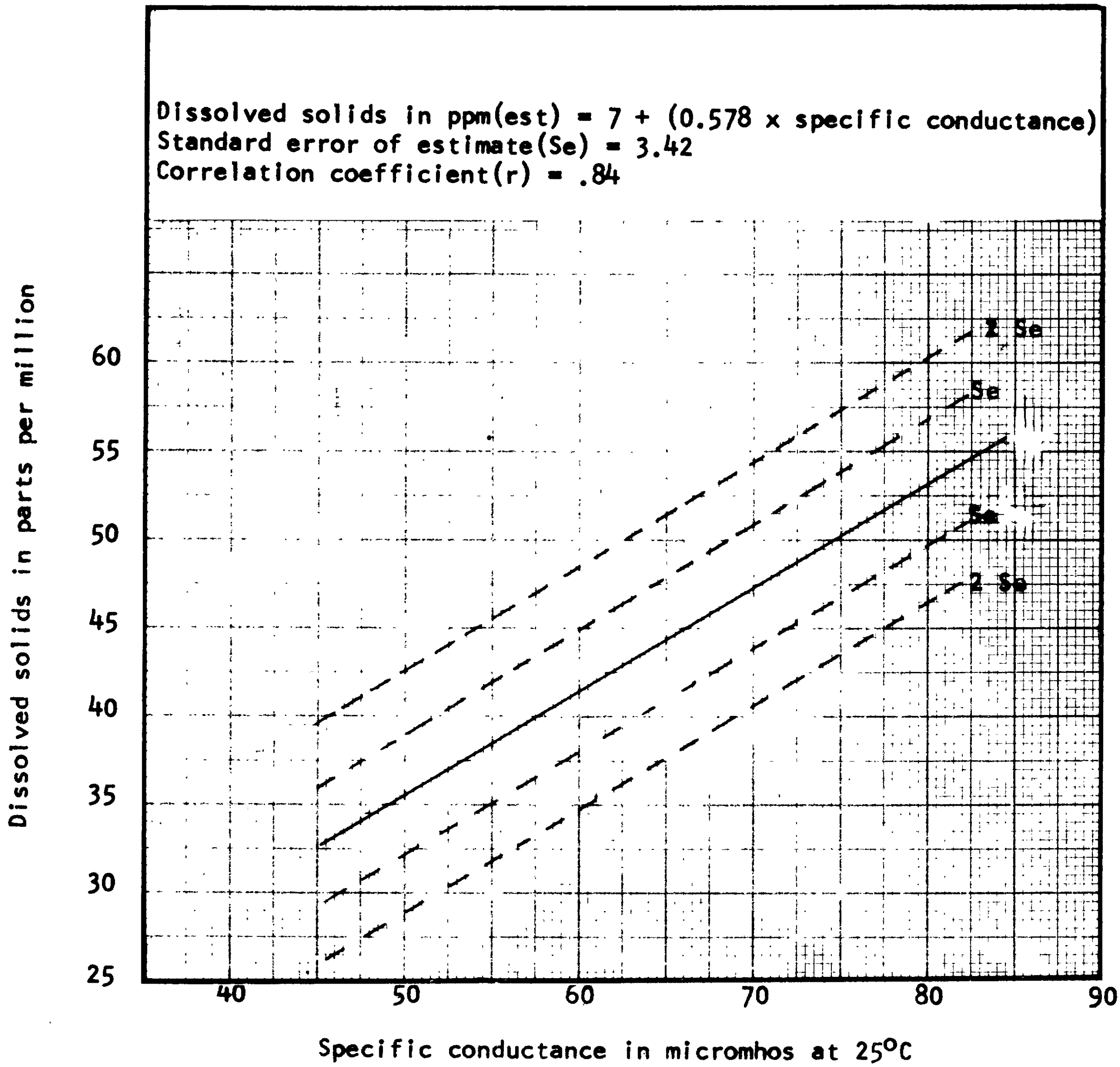


Figure 6. - Dissolved solids and specific conductance, Neversink River at Godeffroy, 1958 water year

Suspended Sediment

The quality or utility of water is determined by more than its chemical composition. One important factor is the suspended sediment carried by the stream.

Suspended-sediment content of a stream is expressed in two ways, concentration and load. Concentration is the ratio of the weight of the sediment to the weight of the water-sediment mixture and is commonly reported in parts per million (ppm). Load is the weight of the suspended sediment carried by the stream for a given period of time and is commonly expressed in tons per day. Load is computed from the mean concentration and the mean water discharge of the stream for the given period of time.

Suspended-sediment concentrations were measured in the Delaware River at Port Jervis from February 14, 1957, to September 30, 1959. Port Jervis is at the lowest point on the main stem of the Delaware River in the New York part of the Delaware River basin, as such it is a reflection of the sediment production of the rest of the basin above this point. The mean daily concentrations of the suspended sediment were generally low, exceeding 100 ppm only 2 percent of the time.

Table 2 gives a summary of the suspended-sediment concentration

Table 2. - Summary of suspended-sediment concentration and load data, Delaware River at Port Jervis, February 14, 1957 to September 30, 1959

Daily mean concentration in parts per million		
Maximum	Minimum	Time-weighted Average
559	0.3	14

Load in tons per day		
Maximum	Minimum	Time-weighted Average
69,500	0.8	582

and load data. Appendix table 13 gives the daily values of the suspended sediment for the period.

The suspended-sediment load carried by the Delaware River is a significant loss of soil from the basin. In the period from February 14, 1957 to September 30, 1959 over half a million tons of suspended sediment were carried by the Delaware River passed Port Jervis. This does not include the sediment which is trapped in the several reservoirs in the basin, or which is carried as bed load.

Suspended-sediment load varies considerably with time. In fact, over 400,000 tons were discharged by the Delaware River at Port Jervis during just 18 days of the period of record. This was less than 2 percent of the time period. The other 98 percent of the time, the suspended-sediment load was less than 5,000 tons per day and averaged only 160 tons per day.

High water discharge generally means a high sediment load. Yet, the load at a given discharge cannot be predicted. Generally, there are wide fluctuations of suspended-sediment load for a given flow. At Port Jervis, when daily mean discharge was about 5,000 cfs, the suspended-sediment load in the Delaware River ranged from 25 to 513 tons per day (1958 water year). Such wide variations in load are the result of seasonal effects, impoundment, the amount of erodable material available, and the transporting capacities of the stream.

The particle size of the suspended sediment at Port Jervis is composed mainly of silt (0.004 to 0.062 mm diameter) and sand (0.062 to 1.00 mm) during periods which carry the bulk of the suspended load. (See appendix table 14.)

Sand-sized particles comprised between 12 and 57 percent of suspended sediment in analyzed samples collected during these periods (See table 14 in appendix). Generally, the percentage of sand-sized particles increases with increasing discharge, while those of clay (less than 0.004 mm in diameter) and silt decrease.

Temperature

Water temperature is another important characteristic to be considered in making an appraisal of the hydrology and suitability of water for public, industrial, and agricultural uses. When surface water is used for cooling purposes, an increase in water temperature decreases the efficiency of the cooling process. Most streams in the Delaware River basin are suitable for cooling, because temperatures higher than 80°F are unusual (tables 15 - 16 in appendix).

As with all surface waters, the water temperature fluctuates seasonally with the air temperature; and, except during freezing weather, commonly lies somewhere between the average and the maximum daily air temperature. Exceptions sometimes occur when streamflow is very low or the river contains a large portion of ground water. The relationship of water temperature to the air temperature of the Neversink River at Godeffroy is shown in figure 7.

Prospective users of water want to know how often certain temperatures occur as well as the range of daily and monthly temperatures. Cumulative frequency curves are helpful in

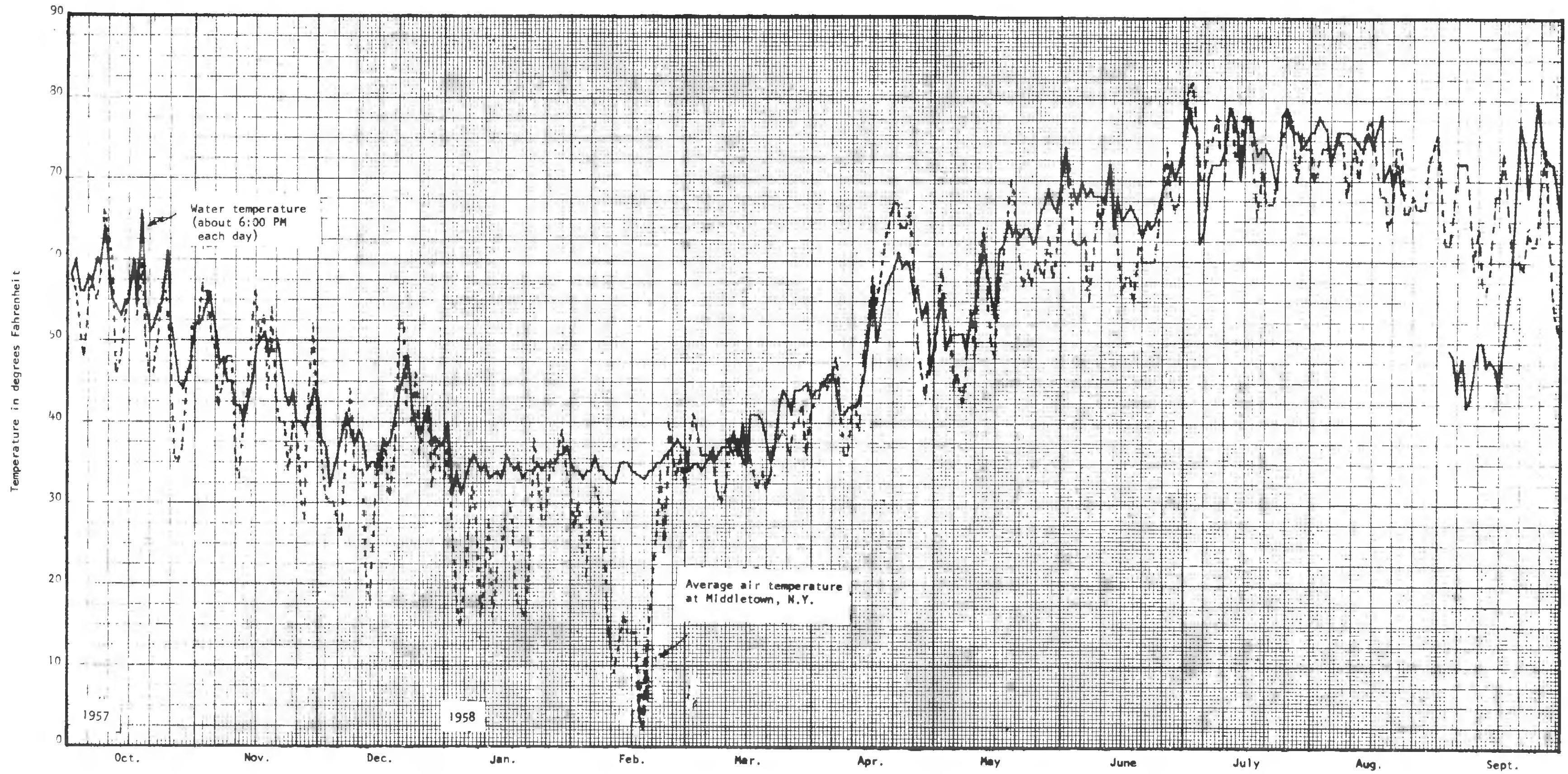


Figure 7. - Water temperature and air temperature, Neversink River at Godeffroy, 1958 water year

estimating the percent of time that a given temperature can be expected (figs. 8 and 9). For example, if a certain industry requires water cooler than 75°F, the Delaware and Neversink Rivers are probably suitable. The water temperatures of these rivers were less than 75°F on 90 percent of the days measured.

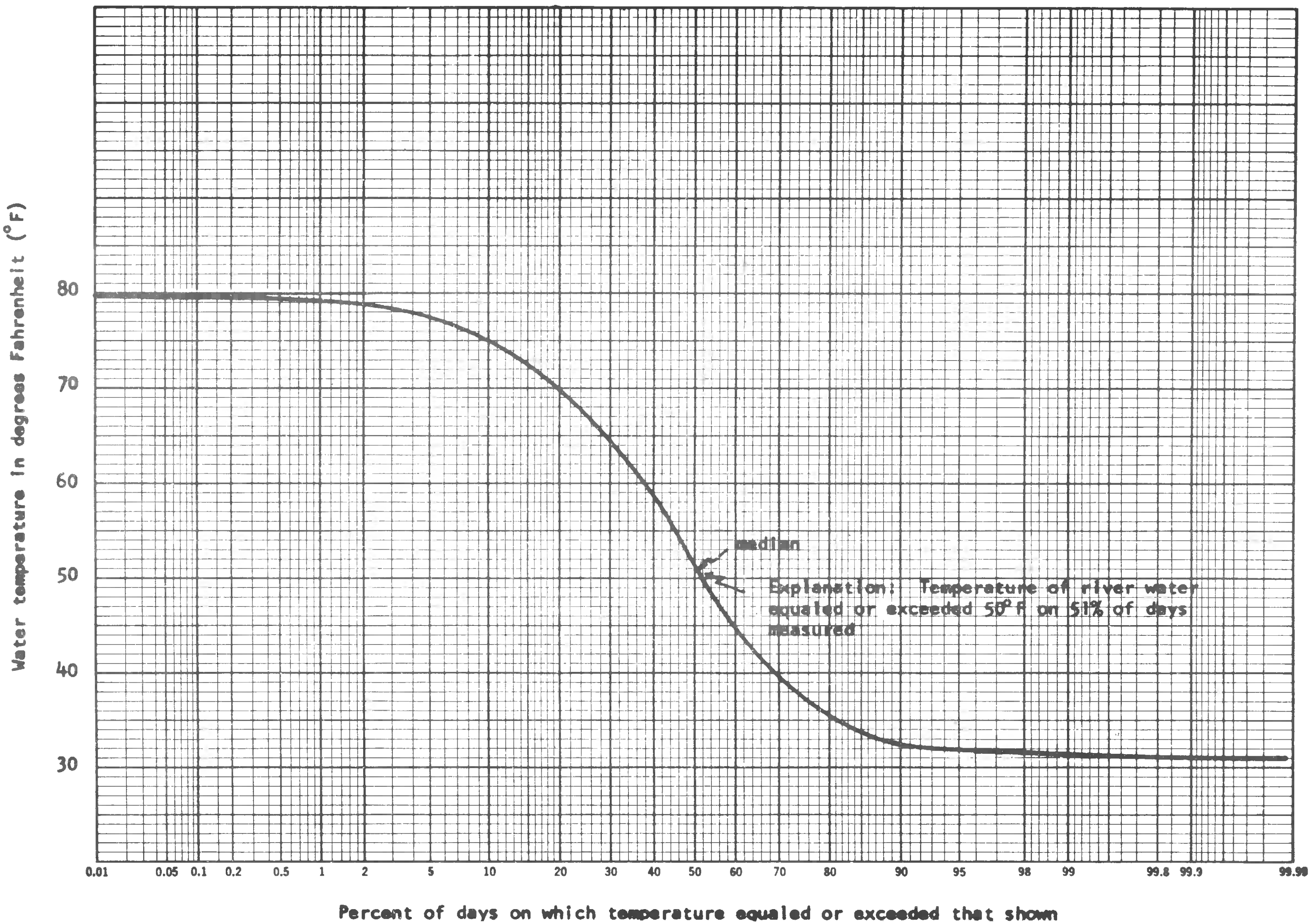


Figure 8. - Cumulative frequency of daily water temperatures, Delaware River at Port Jervis, 1958 and 1959 water years

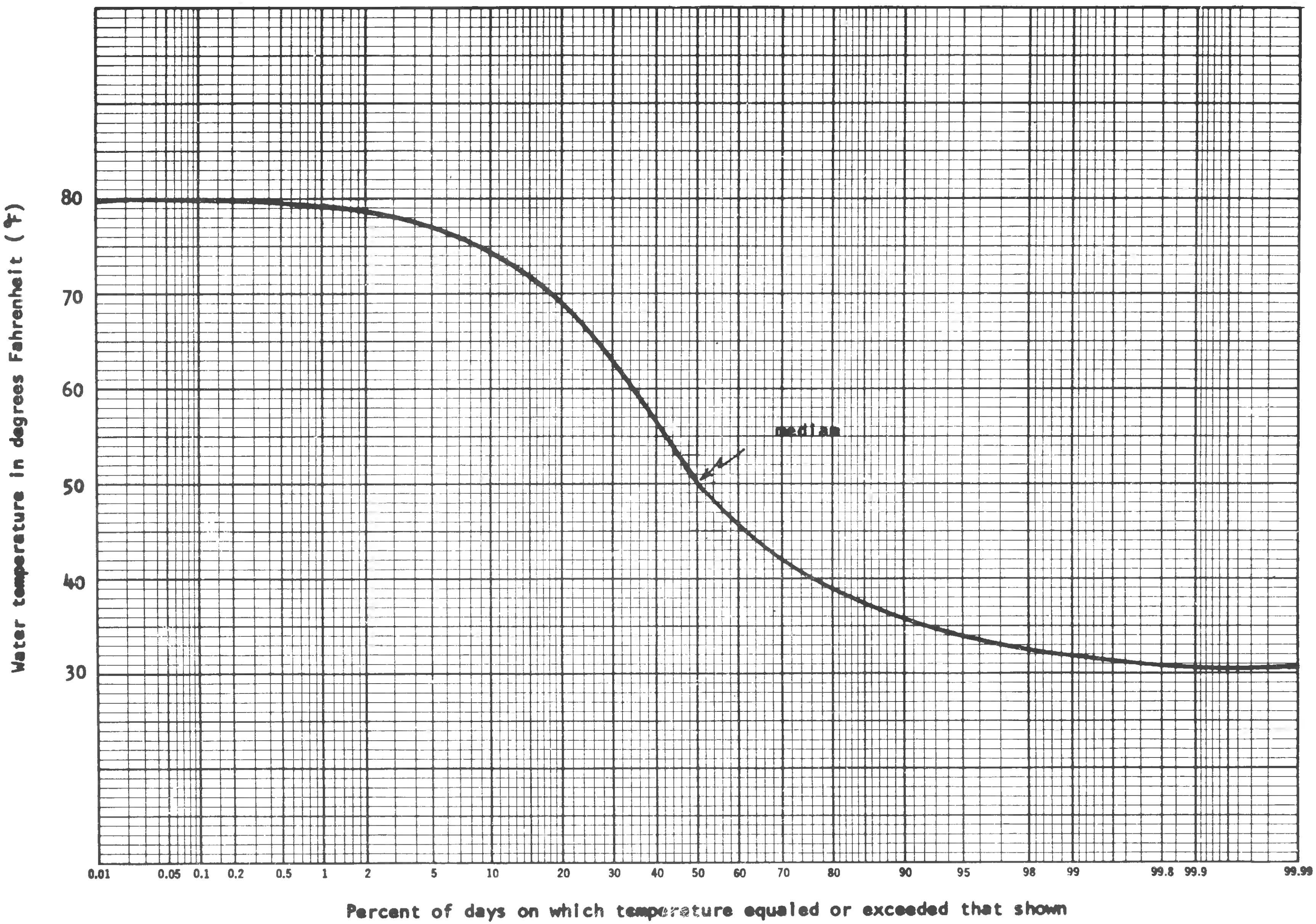


Figure 9.- Cumulative frequency of daily water temperatures, Neversink River at Godeffroy, 1958 water year

Water in Reservoirs

The quality of impounded surface water is generally better than that of most streams because it is more uniform. When released into the main stem, the quality of downstream surface water is improved. The East Branch of the Delaware River is a good example (see table 8 in appendix). On July 14, 1959, the river was sampled at Margaretville and at Harvard. At Margaretville (drainage area 163 square miles), above the Pepacton Reservoir, the dissolved-solids content was 39 ppm, and the hardness of water was 28 ppm. Below the reservoir, at Harvard (drainage area 457 square miles), the dissolved-solids content was only 32 ppm, and the hardness of water was only 19 ppm. This improvement in quality is attributed to dilution by the water from storage. (See table 3 for chemical analyses of water in reservoirs.)

The difference between the quality of water in East and West Branches of the Delaware River is also attributed to stored water where mixing of low-and-high-flow waters occurs. Both branches drain areas of similar environment. However, the East Branch is impounded (Pepacton Reservoir) while the West Branch is largely unregulated (1962). Chemical analyses

Table 3. - Chemical analyses of water in reservoirs

(Chemical constituents, dissolved solids, and hardness in parts per million. Analyses by Geological Survey, United States Department of the Interior.)

Source	a	a	b	c
	Date of Collection			
Constituent or property	Jan. 14 1960	June 1 1960	June 1 1960	June 1 1960
Silica (SiO_2)	3.3	4.0	1.5	0.2
Iron (Fe)	.14	.05	.09	.03
Manganese (Mn)	.00	.01	.00	.00
Calcium (Ca)	5.6	4.8	3.6	5.2
Magnesium (Mg)	2.3	2.6	2.1	2.3
Sodium (Na)	2.7	1.8	1.4	1.2
Potassium (K)	1.2	.9	.8	.6
Bicarbonate (HCO_3)	10	8	6	13
Carbonate (CO_3)	0	0	0	0
Sulfate (SO_4)	13	13	12	11
Chloride (Cl)	3.6	4.4	2.1	2.3
Fluoride (F)	.0	.1	.2	.2
Nitrate (NO_3)	2.2	1.4	.6	.7
Dissolved solids Residue on evaporation at 180°C	42	41	32	34
Hardness as $CaCO_3$	24	28	22	26
Noncarbonate hardness as $CaCO_3$	16	21	17	16
Specific conductance (micromhos at 25°C)	61	55	43	50
pH	6.4	6.1	6.1	6.5
Color	3	9	6	3

[a]Swinging Bridge Reservoir near Fowlersville
[b]Toronto Reservoir near Black Lake
[c]Pepacton Reservoir near Wolf Hollow

(tables 8 and 9 in appendix) indicate that the dissolved-solids content of the East Branch was generally about 27 percent less than that of the West Branch on the same day. Individual constituents, including calcium and magnesium, were also less. Because of the lower concentrations of calcium and magnesium, the hardness of water in the East Branch was less than that of water in the West Branch. Generally the other dissolved constituents were similarly reduced (see tables 8 and 9).

In addition to improving chemical quality, reservoirs also improve the physical quality of streams. Although overland runoff, during and after storms, is low in dissolved-solids content, it often contains high concentrations of suspended sediment. When surface water flows into a reservoir, the water's velocity is checked and its turbulence is reduced. Consequently, much of the suspended sediment settles out. Streams in the Delaware River basin are typical in this respect. They commonly contain low concentrations of sediment that increase during periods of heavy storm runoff. It is precisely at these times that it is necessary to fill reservoirs. As the water is impounded, some of the suspended

sediment is deposited and the physical quality of stored water is improved.

Ground Water

Chemical Quality

The quality of ground water in the Delaware River basin is not as good as that of surface water, but water from wells is suitable for most purposes. Maximum and minimum concentrations from chemical analyses of water from 13 wells are given in table 4, and the quality of water from each of several aquifers is shown in table 17 in the appendix. (Table 18 gives the well data for these wells.)

Water from unconsolidated deposits (mainly sand and gravel) contained between 28 and 94 ppm of dissolved solids, while water obtained from bedrock contained between 69 and 491 ppm of dissolved solids. Chemical composition of water from sand and gravel, sandstone, and sandstone and shale is shown in figure 10. Observed hardness of ground water is generally less than 70 ppm, but may exceed 100 ppm. The ground waters sampled are of acceptable quality for most uses, except locally where the content of iron, manganese, or chloride is excessive.

The number of wells sampled for chemical analysis is too few in number to allow conclusions as to variation of

Table 4. - Summary chemical analyses of ground water

(Based on analyses of 13 wells)

(Chemical constituents, dissolved solids, and hardness in parts per million)

Constituent or property	Maximum	Minimum
Silica (SiO_2)	14	4.7
Iron (Fe)	8.4	.05
Manganese (Mn)	.38	.00
Calcium (Ca)	28	4.4
Magnesium (Mg)	9.6	1.2
Sodium (Na) Potassium (K)	156	1.4
Bicarbonate (HCO_3)	148	6
Carbonate (CO_3)	0	0
Sulfate (SO_4)	<30	4.1
Chloride (Cl)	228	.6
Fluoride (F)	.2	.0
Nitrate (NO_3)	13	.0
Dissolved solids		
Residue on evaporation at 180°C	491	28
Hardness as $CaCO_3$	109	16
Noncarbonate hardness as $CaCO_3$	18	0
Specific conductance (micromhos at 25°C)	958	44
pH	8.1	5.8
Color	15	2
Temperature (°F)	62	47

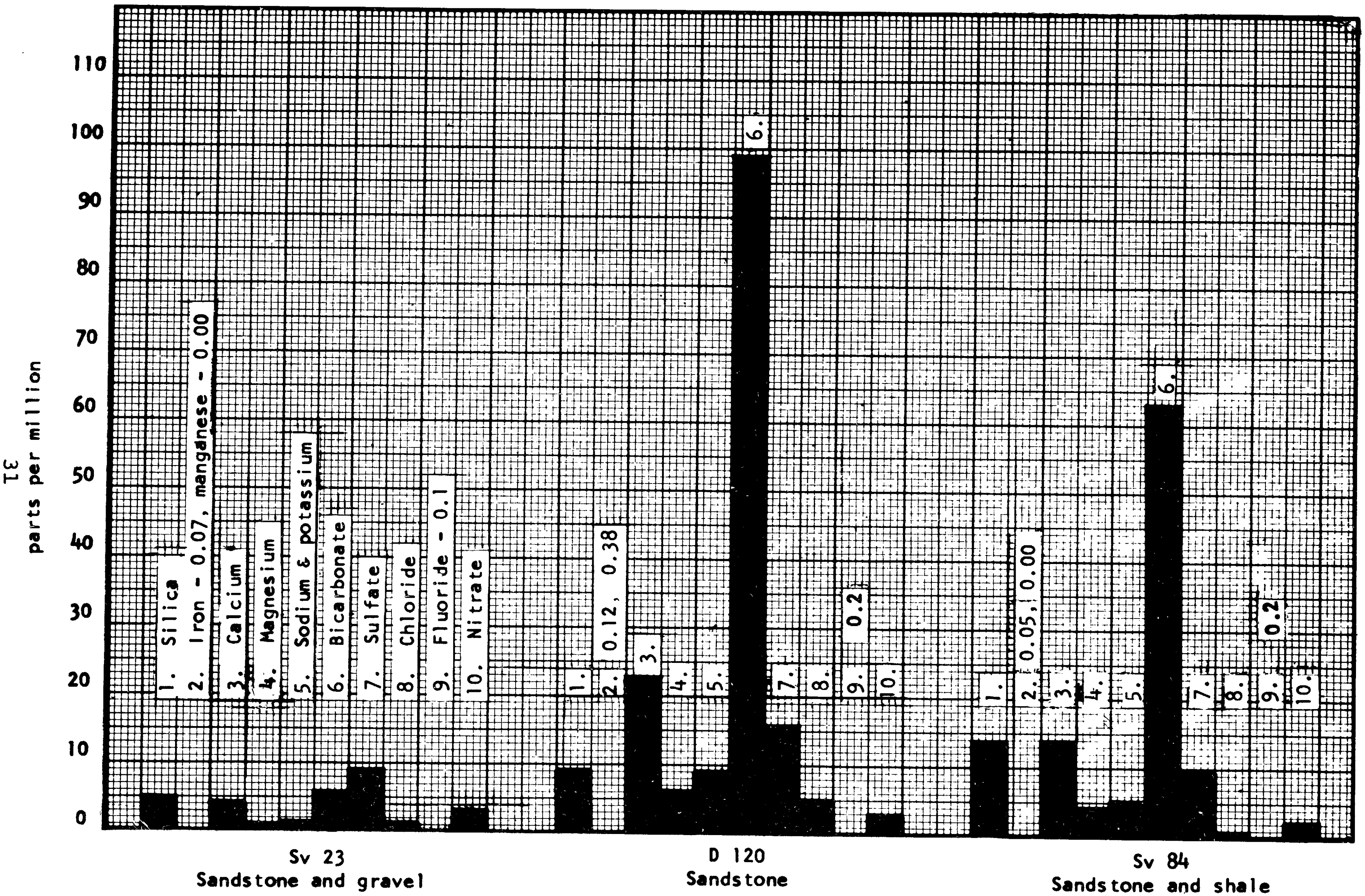


Figure 10. - Chemical composition of water from selected wells

quality with depth of aquifer, or to define the water-quality characteristics of a particular aquifer. Several wells in the basin are reported to contain salty and sulfide-tasting water (no analyses are available at present). These saline waters presumably came from ancient marine beds that entrapped salt water. When the ocean receded from the land about 200 million years ago, the marine beds were deposited. The sulfide taste or odor may be a product of the reaction between organic matter, calcium, sulfate, and bacteria.

Temperature

The temperature of water in a well 30 to 60 feet deep commonly remains at or slightly above the annual mean air temperature (Collins, 1925, p. 98). The annual mean air temperature at Port Jervis (based on 74 years of record) is about 50°F. As a result, it is to be expected that the temperature of nearby ground water will be similar or slightly higher. Table 4 shows that the temperature of ground water in the wells sampled throughout the basin in New York ranges from 47 to 62°F.

WATER QUALITY AND USE

Chemical quality, temperature, and suspended sediment determine in part the utility of a water supply. Some of the main uses of water for which quality is important are: agriculture, industry, and public water supplies. Each of these uses has its own quality requirements or tolerances so that water suitable for some agricultural purposes may not be acceptable for use in industrial processing. Table 5 lists the chemical constituents commonly found in water, their occurrence, their effect when used, and the user concerned with these effects.

Although water for agricultural purposes commonly means crop irrigation in many parts of the country, there is little or no irrigation in this region. Here, the primary agricultural activity is dairy farming, and the quality of the water used for stock presents no special problem. The animals drink water from the same source used by the farmer for domestic needs. Although the tolerance of animals to dissolved solids in drinking water varies depending upon their weight, metabolism and daily water consumption, livestock tolerate greater concentrations than man.

Table 6. - Public water supply systems in Delaware River basin[a]

(serving more than 1000 people)

Municipality	Owner	Source	Maximum population supplied	Maximum average consumption (mgd)	Hardness of water (ppm as $CaCO_3$)
Bethel	A. N. Smallwood Co.	G. W.	4,000	0.150	60
Callicoon	Callicoon Water Co.	G. W.	1,000	.100	30
Delhi	V	S. W.	2,223	.250	14
Deposit	V	S. W. and G. W.	2,021	.250	18
Hancock	V	S. W. and G. W.	1,560	.180	21
Kiamesha	Kiamesha Spring Water Co.	S. W. and G. W.	8,000	.700	34
Liberty	V	S. W.	15,000	1.0	20
Livingston Manor	T (Rockland)	S. W.	2,000	.300	20
Monticello	V	S. W.	12,600	1.4	28
Narrowsburgh	T (Tusten)	G. W.	1,600	.200	58
Port Jervis	C	S. W.	10,000	2.5	26
Roscoe	Roscoe Water Co.	S. W.	1,100	.100	20
So. Fallsburgh	T (Fallsburgh)	G. W.	10,000	.500	58
Stamford	V	S. W.	1,162	.350	33
Swan Lake	T	G. W.	4,000	.300	20
Walton	V	S. W.	3,947	.400	25
White Sulphur Springs	T (Liberty)	G. W.	1,000	.050	44
Woodbourne	T (Fallsburgh)	G. W.	4,000	.224	60
Woodbridge	V	S. W.	5,000	.600	20
Wurtsboro	V	G. W.	3,000	.250	70
Wurtsboro Hills	Wurtsboro Hills Water Corp.	G. W.	2,000	.100	60

[a]New York State Department of Health, Bureau of Environmental Sanitation, 1960, Public Water Supply Data; Bulletin 19

S. W. = surface water
G. W. = ground water (wells)
mgd = million gallons per day
V = village
T = town
C = city

On the other hand, water used for a specific industrial purpose may have definite limits as to permissible dissolved-solids content, temperature and suspended-sediment concentration. The exact quality requirements depend upon the particular use of the water, and thus may cover a wide range. In fact, some industries may need several different qualities of water, depending upon whether the water is to be used for cooling, power development or for processing.

In theory, water used for cooling has only one requirement: it must be cool enough. If the water meets temperature requirements, it is generally acceptable. Therefore, otherwise poor water may be used for cooling. However, it is not good economics. Poor quality water can cause trouble by depositing scale or by corroding equipment and may require costly treatment before use.

In this area, the temperature of ground water is low enough at all times, and surface water at most times, to be a satisfactory coolant for many industrial uses. Much ground water is used for this purpose by several creameries processing bulk milk, the principal industrial activity of the area.

An industry that is unusual because it has little or no water-quality requirements is power development. Three hydroelectric plants on the Mongaup River system are more interested in quantity than quality of water. About their only requirement is that there be enough water to turn their generators. Sufficient water is assured by storing a supply in reservoirs for use during dry periods.

Water used for industrial purposes, other than cooling and power development, must meet so many and so varied requirements that it is impossible to classify the basin's water as to its suitability. However, available data indicate that most of the water is good enough for most industrial processes. Actually, there are very few manufacturing plants in this basin, and they are mainly located in municipalities where they utilize the excellent public water supplies.

Not only do public supply systems deliver excellent-quality finished water, they are also the largest consumers of raw water in the basin. By far the biggest user is the New York City Board of Water Supply, now diverting up to 490 million gallons per day (mgd) from the Delaware River basin. When the Cannonsville Reservoir is completed, this volume will

be increased by 310 mgd for a maximum diversion of 800 mgd. That will be about 6 percent of the total amount supplied by all the water utilities of the United States.

If compared to the huge quantities of water withdrawn by New York City, the modest requirements of villages inside the basin seem insignificant. However, the total consumption of the public water supply systems listed in table 6 is about 10 mgd. In this area, the larger settlements like Liberty and Port Jervis obtain their water from surface streams. Smaller localities generally rely on wells or on a combination of wells and streams.

Whether the source is surface water or ground water, these water utilities are fortunate because the quality of the raw water is so good that chlorination is generally the only treatment required. Dissolved-solids content is low, and the water is generally soft. Table 6 shows that finished water from public supply systems in the Delaware River basin ranges from soft to moderately hard and that the hardest water comes from ground-water sources. Hardness of water as high as 70 ppm is only relatively high. Yet, in many areas of the United States, the water would be classed as quite soft.

Table 5. - Major constituents in water, their occurrence, effect, and user concerned

CHEMICAL CONSTITUENTS	OCCURRENCE	EFFECT	USER CONCERNED
Silica (SiO_2)	Found in all natural waters in varying concentrations. Ground waters, generally, contain more silica than surface waters.	Forms boiler scale and deposits on turbine blades.	Industry
Iron (Fe) and Manganese (Mn)	In practically all natural waters. Generally, smaller amounts are found in surface waters than in ground waters.	Concentrations in excess of about 0.3 ppm iron or 0.05 ppm manganese stain laundry, porcelain fixtures and other materials.	Industry and public water supplies
Calcium (Ca) and Magnesium (Mg)	In all natural waters. Highest concentrations found in water in contact with limestone, dolomite, and gypsum.	Soap consuming. Forms an insoluble curd and deposits in pipes and boiler tubes.	Industry and public water supplies
Sodium (Na) and Potassium (K)	In all natural waters. In very low concentrations of alkalies, concentrations of sodium and potassium are about equal. As concentrations of alkalies increase proportion of sodium increases.	Large amounts may cause foaming in boiler operation. In irrigation waters, large amounts degrade the soil.	Industry, public water supplies and agriculture
Bicarbonate (HCO_3)	In all natural waters. Larger concentrations present in waters in contact with decaying organic matter, and carbonate rocks.	Large amounts may affect taste of drinking water. Large quantities in combination with sodium degrade the soil.	Industry, public water supplies and agriculture
Sulfate (SO_4)	Present in most natural waters. Larger amounts in waters in contact with gypsum and shale.	In conjunction with calcium and magnesium forms permanent hardness and hard scale in boiler operation.	Industry and public water supplies
Chloride (Cl)	Present in most natural waters. Larger amounts in contaminated waters.	Taste of drinking water affected when amounts of more than about 250 ppm are present. Corrosiveness is also increased.	Industry and public water supplies
Fluoride (F)	Present in most natural waters in small concentrations.	About 1.0 ppm believed to be helpful in reducing incidence of tooth decay in small children. Believed to cause mottled enamel on teeth at higher concentrations. (Lohr and Love, 1952, p. 39).	Public water supplies
Nitrate (NO_3)	Present in most natural waters. Contamination by sewage and organic material increases quantity present.	Small amounts have no effect. Forty-five ppm or more reported to produce methemoglobinemia in infants. May indicate pollution.	Public water supplies

In addition to the major uses of water, there are other uses such as bathing and recreation, fishing and fish culture, fire protection, transportation, and waste disposal. All of these uses of water, although not as important as industrial and domestic uses, are necessary to the economic life of the area.

In a resort area like the Catskills, widespread use is made of surface waters for swimming, boating, and other aquatic recreations. There are many locations where unsupervised bathing takes place, but most vacationers swim at approved sites where the water quality is the responsibility of local health officials. Boating is popular wherever there is water. There are legal restrictions on boating above the reservoirs; not because of poor water quality, but to maintain the exceptional good quality.

Recreational fishing is extensive in the basin, and is expected to increase. Even now, the Neversink River, Beaver Kill, Willowemoc Creek, and the East Branch Delaware River are famous for trout fishing. Quality requirements for water to support fish life are quite high, with certain limits of temperature, pH, and dissolved-oxygen content among the more

important characteristics. These requirements are met in many streams in the basin, particularly in the northern section, according to the New York State Department of Health (1960). Health Department analyses show that most surface waters contain about 8 - 10 ppm of dissolved oxygen, approximately twice as much as the 5 ppm minimum needed for fish culture (Ellis and others, 1946, p. 24). It is believed that fishing in the basin will be improved when the Cannonsville Reservoir is completed, because the reservoir will release colder water into the river system. Cold water is the preferred habitat of trout.

Hot or cold, water of any quality can be utilized for fire protection, transportation, and waste disposal. Farm ponds are widely used for fire protection, and several fire departments rely on surface streams for their water supply. There is little utilization for transportation, mainly because of rapids and dams. However, there is widespread use of the waters for waste disposal. A comprehensive list of communities and industries disposing of their waste in streams may be found in the New York State Department of Health Water Pollution Control Board Report -- The Delaware River drainage basin, (1960).

THE FUTURE WATER-QUALITY SITUATION

The generally good to excellent quality of water resources in the Delaware River basin is mainly the result of natural factors. Among these factors are geology and geography (including location, physiography, drainage pattern, and climate). Natural factors are either permanent or change so slowly that they appear to be permanent. Therefore, it is believed that, in the near future, water quality in this area will remain basically the same as at present (1963).

Since this is a relatively undeveloped area, it is obvious that future works of man will affect the quality of water resources. However, the improved surveillance and regulatory power of the state agencies concerned can be expected to provide the water management essential to the continued excellence of the basin's water resources.

On the basis of the largely unchanging causative factors mentioned above, plus improved supervision, it can be expected, barring unusual droughts or floods, that even with additional commerce and industry there should be little, if any, change in the quality of the water.

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GLOSSARY

<u>Aquifer</u>. A formation, group of formations, or part of a formation that is water bearing.

<u>Bedrock</u>. The solid rock underlying soil, sand, clay, etc.

<u>Cubic foot per second (cfs)</u>. The rate of discharge of a stream whose channel is one square foot in cross-sectional area, and whose average velocity is one foot per second.

<u>Dissolved solids</u>. Residue from a clear sample of water after evaporation and drying of residue for one hour at 180°C.

<u>Hardness of water</u>. That property of water attributable to the presence of alkaline earth metals; of which calcium and magnesium are the principal ones. Hardness is expressed in terms of the calcium carbonate equivalent of the carbonate and bicarbonate content of water. The hardness in excess of this amount is called noncarbonate hardness.

<u>Micromho</u>. One millionth of a reciprocal ohm. The specific conductance of water is the reciprocal of specific resistance. Specific resistance is the resistance in ohms, of a column of water 1 centimeter long and 1 square centimeter in cross section. In most water, the conductance

is so low that micromho (one millionth of a mho) is used as the unit of expression.

pH. The negative logarithm (to the base 10) of the hydrogen-ion concentration. Water having a pH of 7 is considered to be neutral. pH above 7 indicates increasing alkalinity; below 7 denotes increasing acidity.

Parts per million (ppm). A unit weight of a dissolved constituent in a million unit weights of solution. Equivalent to one milligram of solute per liter of solution.

Sandstone. A cemented or otherwise compacted detrital sediment composed predominantly of quartz grains.

Shale. A laminated sediment, in which the constituent particles are predominantly of the clay grade (size).

Specific conductance. A measure of the ability of water to carry an electric current. Within rather wide limits, specific conductance is a measure of the ionic strength of the solution. (See micromho)

Suspended sediment. The material carried by the upward components of the turbulent currents of a stream or by colloidal suspension.

Till. Nonsorted, nonstratified sediment carried or deposited by a glacier.

Unconsolidated deposits. Uncompacted, uncombined material such as sand, gravel, till, and so forth, found on the earth's surface, above the bedrock.

Water year. The 12-month period beginning October 1 of a year and ending September 30 of the following year. The 1958 water year covers the period from October 1, 1957 to September 30, 1958.

Weathering. Processes which cause rocks to change in character, decay, and finally crumble into soil.

APPENDIX

Tables of basic data

Table 7. - Chemical analyses of water from streams in the Delaware River basin

(Chemical constituents, dissolved solids, and hardness in parts per million)

Site No.[a]	Source and Location	Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
1	E. Br. Delaware River at Margaretville	July 14, 1959	26	3.6	0.06	7.2	2.3	2.4	0.9	20	10	3.3	0.1	2.0	39	28	11	67	6.5	4
		June 1, 1960	254	7.4	.10	5.5	2.0	1.2	.5	16	7.5	1.8	.2	.6	33	22	9	51	6.7	5
2	Platte Kill at Dunraven	July 14, 1959	3.3	3.7	.06	11	2.5	9.3	1.3	30	9.4	18	.1	2.7	76	38	14	139	6.6	2
		Apr. 12, 1960	98	2.2	.01	4.9	1.2	1.2	.5	10	10	1.2	.0	1.8	35	17	9	50	6.8	3
3	Mill Brook at Arena	Jan. 13, 1960	53	2.5	.04	4.8	1.9	.6	.5	9	9.6	.3	.0	1.7	25	20	13	40	6.7	2
4	Tremper Kill nr Shaverton	Jan. 13, 1960	49	4.3	.21	4.9	1.6	1.9	.8	11	10	2.0	.0	2.3	33	19	10	54	6.4	3
5	Terry Clove Kill nr Pepacton	Jan. 13, 1960	21	3.9	.16	4.2	1.7	1.1	.7	10	9.4	1.0	.0	1.3	28	18	10	45	6.3	4
6	E. Br. Delaware River at Downsville	Jan. 13, 1960	10	3.9	.17	4.8	1.8	1.5	.8	11	11	2.0	.0	1.4	32	20	11	54	6.3	3
		Apr. 12, 1960	808	2.5	.02	5.8	.9	1.1	.6	10	9.7	1.7	.0	1.7	32	18	10	49	6.5	3
7	E. Br. Delaware River at Harvard	July 14, 1959	678	1.3	.02	6.2	.7	1.3	.8	12	12	1.2	.0	1.2	32	19	9	50	6.1	4
		Apr. 12, 1960	1,090	1.8	.00	5.9	.8	1.1	.5	11	9.3	2.0	.0	1.5	28	13	9	48	6.4	2
8	Beaver Kill nr Turnwood	Jan. 13, 1960	--	2.3	.02	5.0	1.7	.5	.5	10	10	.5	.0	2.7	26	20	12	39	7.1	4
		Apr. 12, 1960	--	2.4	.04	5.0	.8	.7	.3	7	10	.4	.0	2.6	31	16	11	42	6.6	3
9	Beaver Kill at Craigie Clair	Jan. 13, 1960	202	1.8	.03	4.7	1.3	.6	.5	9	9.6	1.0	.0	1.6	25	17	10	39	6.7	3
		Apr. 12, 1960	312	2.1	.01	4.2	.6	.4	.3	7	8.1	.6	.0	1.2	23	13	8	37	6.3	3
10	Willowemoc Creek nr Livingston Manor	Jan. 14, 1960	128	2.6	.06	4.8	2.1	1.9	.8	10	10	4.0	.0	2.3	33	21	13	50	6.4	3
		Apr. 12, 1960	259	2.1	.04	4.2	.8	1.2	.4	6	8.8	1.7	.0	1.2	24	14	9	38	6.5	5
11	Little Beaver Kill nr Livingston Manor	Jan. 14, 1960	28	2.8	.09	5.6	1.7	1.1	.7	10	13	1.9	.0	2.3	31	21	13	49	6.8	3
		Apr. 12, 1960	90	1.5	.03	4.6	.5	.8	.5	6	8.0	1.2	.0	.7	25	14	9	38	6.0	4
12	Beaver Kill at Cooks Falls	Apr. 6, 1954	239	1.4	.02	5.4	1.0	1.1	.6	10	8.4	1.2	.1	3.9	28	20	12	42	6.8	1
		Aug. 17, 1954	12	1.2	.10	7.2	.9	1.8	1.1	18	9.2	2.3	.1	.8	43	22	7	60	6.9	5
		Jan. 13, 1960	501	--	.03	--	--	3.0		9	10	2.1	--	1.9	--	16	9	46	7.0	--
		Apr. 12, 1960	906	1.4	.00	4.8	.6	.8	.3	7	8.8	1.1	.0	.8	27	15	9	39	6.3	2
13	E. Br. Delaware River at Fishs Eddy	Average of 24 analyses	--	2.2	.06	6.1	1.0	1.5	.6	12	9.2	2.8	.1	1.5	33	20	10	52	--	4
14	W. Br. Delaware River at Delhi	July 14, 1959	14	3.4	.11	13	2.0	4.1	1.2	31	10	6.8	.1	3.6	65	41	15	110	6.8	4
		June 1, 1960	200	2.8	.07	8.1	1.8	2.2	.9	23	10	2.7	.1	1.8	46	28	9	73	6.8	7
15	Little Delaware River nr Delhi	July 14, 1959	5.2	3.1	.04	8.8	1.5	3.6	1.2	28	7.7	6.0	.1	1.8	46	28	5	81	6.9	5
		June 1, 1960	82	5.0	.04	7.8	2.0	1.7	.7	24	7.5	2.3	.2	.8	42	28	8	68	6.9	5
16	W. Br. Delaware River at Walton	July 14, 1959	44	3.2	.08	9.7	2.3	3.9	1.2	28	10	6.2	.1	2.7	54	34	11	95	6.8	2
		Apr. 12, 1960	1,100	3.7	.03	7.0	1.2	3.5	1.4	11	11	3.0	.1	3.2	47	23	14	63	6.4	2

[a] Location of site shown on figure 4

Table 7. - Chemical analyses of water from streams in the Delaware River basin - continued

(Chemical constituents, dissolved solids, and hardness in parts per million)

Site No.[a]	Source and Location	Date of collection	Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
17	Dryden Creek at Granton	July 14, 1959	1.6	11	0.02	6.4	2.6	2.2	0.9	22	9.5	1.5	0.1	2.2	38	27	9	64	6.7	3
		Apr. 12, 1960	29	4.0	.10	4.4	1.2	1.9	1.4	10	11	.5	.0	.8	37	16	8	42	6.8	7
18	Trout Creek at Cannonsville	July 14, 1959	7.3	4.3	.08	6.2	1.7	2.7	1.2	20	8.5	3.0	.1	1.9	39	23	6	66	6.6	7
		Apr. 12, 1960	145	3.9	.04	4.8	1.4	1.6	.7	11	10	2.3	.0	1.6	33	18	9	52	5.9	4
19	W. Br. Delaware River at Stilesville	July 14, 1959	75	2.9	.16	10	1.8	5.2	1.8	32	7.5	5.8	.1	1.7	56	33	7	99	7.5	5
		Apr. 12, 1960	1,640	3.2	.01	6.7	1.5	2.2	1.0	12	10	3.9	.0	2.8	39	23	13	61	6.0	3
20	Oquaga Creek at Deposit	July 14, 1959	6.8	3.3	.05	9.8	1.7	4.1	1.5	23	12	6.0	.1	1.9	54	32	13	95	6.5	5
		Apr. 12, 1960	240	3.2	.03	4.5	1.7	1.1	.8	8	9.4	2.9	.0	1.3	33	18	12	50	6.3	3
21	W. Br. Delaware River at Hale Eddy	Average of 24 analyses	--	3.0	.07	7.4	1.8	3.0	1.2	20	10	4.2	.1	1.8	45	26	10	74	--	4
22	Callicoon Creek at Callicoon	Apr. 6, 1954	105	1.7	.03	7.4	1.2	1.9	1.0	14	12	2.8	.1	2.2	41	25	13	62	7.0	2
		Aug. 16, 1954	12	1.7	.13	9.1	1.0	2.9	1.7	25	9.6	3.8	.2	.6	50	27	6	78	7.0	5
		July 2, 1957	18	1.7	.05	9.3	1.2	2.3	1.3	25	9.7	3.2	.1	.5	48	28	8	80	6.8	5
		Apr. 8, 1958	1,080	2.8	.13	5.2	1.1	1.2	1.2	7	11	2.0	.2	2.7	36	18	12	49	5.8	4
23	Tenmile River at Tusten	July 14, 1959	6.4	2.8	.12	6.2	1.1	2.1	1.0	14	9.2	1.1	.1	1.8	37	20	9	54	6.2	8
		Apr. 12, 1960	130	3.6	.05	4.6	.5	2.4	1.4	4	12	1.8	.1	.9	38	14	10	42	6.0	5
24	Delaware River at Barryville	Average of 12 analyses	--	2.0	.11	6.5	1.1	1.6	.7	14	9.9	2.5	.1	.7	35	21	9	57	--	4
25	Mongaup River nr Mongaup	Apr. 6, 1954	330	2.4	.08	5.8	1.6	2.2	1.1	8	13	3.0	.2	2.7	43	22	15	54	6.7	64
		Aug. 16, 1954	44	3.1	.06	6.1	1.1	1.9	1.2	17	8.2	2.2	.2	.5	38	20	6	54	6.7	10
		July 2, 1957	62	2.5	.03	5.4	1.1	1.9	.8	10	8.9	2.4	.1	.6	34	18	10	51	6.3	8
		Apr. 8, 1958	1,110	3.9	.19	4.8	1.2	2.3	.9	6	11	3.4	.2	2.3	40	17	12	53	5.7	7
26	Delaware River at Sparrow Bush	July 2, 1957	--	1.4	.08	6.2	1.1	2.0	.5	18	8.8	2.6	.0	.4	37	20	5	59	6.9	6
		Apr. 8, 1958	--	2.9	.09	4.2	1.3	1.0	.8	5	14	1.0	.1	1.3	33	16	12	42	6.1	5
27	Delaware River at Port Jervis	Average of 2 years' composite analyses	--	5.0	.04	7.0	1.5	2.3	.8	19	10	3.0	.1	1.0	44	25	10	65	--	4
28	Neversink River nr Claryville	Apr. 6, 1954	145	3.8	.02	3.0	.4	.5	.4	4	6.5	.8	.1	1.3	20	9	6	28	6.2	0
		Aug. 16, 1954	16	1.7	.02	3.0	.8	.7	.8	6	4.6	1.5	.0	.5	21	11	6	29	6.5	8
		Jan. 14, 1960	132	--	.06	--	--	2.5		4	8.4	1.0	--	2.2	--	10	7	30	6.9	--
29	Neversink River at Oakland Valley	Jan. 14, 1960	302	3.9	.02	5.5	2.1	2.2	.9	10	13	3.1	.0	3.4	39	22	14	57	6.8	3
		Apr. 12, 1960	457	3.0	.06	4.8	.7	3.4	1.1	5	12	1.5	.0	1.0	37	15	11	46	6.0	5
30	Neversink River at Godeffroy	Average of 1 year's composite analyses	--	4.7	.14	6.5	1.3	2.7	.7	16	10	3.2	.1	1.4	44	22	9	63	--	7

[a] Location of site shown on figure 4

Table 8. - Chemical analyses of water from East Branch Delaware River at Fishs Eddy, 1958 and 1959 water years

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Discharge (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Specific conductance (micromhos at 25°C)	pH	Color
Oct. 10, 1957	514	57	0.9	0.10	6.6	1.6	1.1	0.4	18	8.7	2.1	0.1	0.8	33	23	8	56	7.0	5
Nov. 12	540	45	1.4	.11	6.4	1.4	1.1	.6	16	10	2.0	.1	.8	34	22	9	56	7.0	2
Dec. 5	952	32	2.1	.09	6.2	1.3	1.1	.8	13	11	2.6	.0	1.4	33	21	11	53	6.3	1
Jan. 2, 1958	1,430	32	2.7	.06	5.2	.6	.6	.4	7	8.6	1.6	.1	1.7	28	16	10	42	7.1	5
Feb. 6	555	33	2.4	.03	5.6	.6	1.6	.6	10	8.3	3.4	.1	1.3	31	17	9	52	6.3	4
Mar. 5	1,030	33	2.3	.07	5.6	1.0	1.2	.4	11	9.7	2.2	.2	.9	30	18	9	51	6.2	2
Apr. 8	6,210	37	2.0	.10	5.3	.3	.6	.3	5	9.0	1.0	.0	1.2	25	14	10	35	6.3	3
May 6	1,580	48	2.0	.04	4.8	.6	.6	.4	8	9.5	1.0	.1	.3	27	15	8	40	6.3	2
June 4	798	64	1.6	.05	5.6	.9	1.1	.7	11	8.5	2.3	.1	.8	29	18	9	46	6.1	3
July 16	243	75	3.1	.05	6.8	1.3	1.8	.7	15	9.6	2.5	.2	1.5	37	23	10	59	6.5	5
Aug. 1	675	56	1.8	.06	6.4	1.1	1.5	.8	13	9.4	2.0	.2	1.2	33	21	10	54	6.7	7
Sept. 19	826	62	2.9	.03	5.6	.7	1.4	.1	11	8.5	2.0	.1	.8	31	17	8	50	6.4	5
Oct. 2	750	55	2.3	.03	6.4	1.2	1.2	.6	13	10	2.7	.1	.2	31	21	11	50	6.7	2
Nov. 6	1,920	45	2.5	.03	6.0	.7	1.1	.3	9	9.0	1.5	.0	.5	27	18	11	43	6.7	5
Dec. 8	1,140	32	2.5	.02	5.6	.8	1.2	.6	10	9.3	2.5	.1	.7	31	18	10	45	6.4	3
Jan. 7, 1959	260	33	2.0	.06	7.2	1.0	2.6	.7	5	10	9.0	.2	4.6	47	22	18	70	5.8	3
Feb. 3	260	32	4.9	.02	6.7	.7	1.7	.6	11	9.8	4.0	.0	1.6	35	20	11	54	6.5	3
Mar. 5	600	32	2.2	.03	6.4	1.2	2.5	1.0	16	7.0	6.0	.0	1.7	40	21	8	59	7.4	3
Apr. 16	1,520	46	1.7	.07	5.4	1.3	1.1	.4	10	8.5	1.2	.0	1.2	31	19	11	42	6.9	8
May 12	612	66	1.4	.19	7.2	1.8	2.7	1.4	22	10	3.6	.0	1.7	43	26	8	72	6.3	5
June 4	345	68	2.0	.01	7.2	1.2	2.4	.7	16	11	3.6	.0	4.1	39	23	10	61	6.6	3
July 14	910	56	1.7	.03	6.4	.9	1.5	.9	13	12	2.2	.0	1.2	34	20	9	54	6.5	3
Aug. 5	740	55	1.7	--	5.8	1.0	1.8	.9	14	7.6	3.1	.0	2.5	29	19	7	52	6.7	6
Sept. 1	1,570	65	2.0	.05	5.7	1.1	2.3	1.1	15	7.0	3.2	.0	2.7	35	19	6	54	7.0	7
Average	1,080	48	2.2	.06	6.1	1.0	1.5	.6	12	9.2	2.8	.1	1.5	33	20	10	52	--	4
Maximum	6,210	75	4.9	.19	7.2	1.8	2.7	1.4	22	12	9.0	.2	4.6	47	26	18	72	7.1	8
Minimum	243	32	.9	.01	4.8	.3	.6	.1	5	7.0	1.0	.0	.2	25	14	6	35	5.8	1

Table 9. - Chemical analyses of water from West Branch Delaware River at Hale Eddy, 1958 and 1959 water years

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Discharge (cfs)	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
															Calcium, magnesium	Noncarbonate			
Oct. 10, 1957	74	57	0.7	0.14	8.9	2.6	4.6	1.1	31	12	6.0	0.2	0.3	53	33	7	98	7.2	5
Nov. 12	113	39	2.2	.06	8.8	2.5	4.4	1.4	27	14	6.5	.1	.2	52	33	11	93	7.1	2
Dec. 5	267	32	3.2	.09	8.7	1.9	3.2	1.2	20	12	6.4	.0	2.0	48	30	13	83	6.4	2
Jan. 2, 1958	1,510	32	4.1	.03	5.8	1.0	1.7	.7	10	8.6	3.5	.2	2.6	38	19	11	61	6.9	4
Feb. 6	620	33	3.5	.11	7.9	1.2	2.5	.8	16	10	4.8	.1	2.2	42	25	12	72	6.3	2
Mar. 5	1,410	33	3.5	.03	6.8	1.6	2.3	1.1	12	10	4.0	.0	2.5	40	24	14	64	6.5	3
Apr. 8	10,300	36	3.3	.29	4.8	.8	1.5	.9	6	10	2.0	.1	3.0	34	16	11	48	6.5	5
May 6	1,810	49	2.7	.06	5.2	1.1	1.7	.6	14	10	1.5	.1	.5	32	18	6	54	6.1	3
June 4	456	67	1.4	.08	7.2	1.7	2.8	1.3	21	10	3.0	.1	1.8	44	25	8	73	6.2	3
July 16	416	76	3.7	.11	7.8	1.7	3.7	1.0	24	9.6	3.2	.2	1.2	45	27	7	74	6.7	7
Aug. 1	270	72	3.8	.09	9.2	2.1	3.5	1.0	29	9.4	4.8	.2	.6	49	32	8	84	6.6	5
Sept. 19	543	--	3.2	.04	7.2	1.7	2.9	1.4	22	10	4.2	.1	.6	43	25	7	75	6.4	5
Oct. 2	85	55	2.6	.03	7.4	2.3	2.7	1.2	23	12	3.6	.0	.1	44	28	9	71	7.5	2
Nov. 6	2,310	45	4.3	.06	6.8	1.2	1.8	.7	13	9.5	2.5	.0	1.4	36	22	12	58	6.7	3
Dec. 8	1,250	33	4.1	.04	6.4	1.9	2.1	.9	14	10	3.7	.1	.9	42	24	13	61	6.2	3
Jan. 7, 1959	240	33	2.1	.04	8.0	1.9	3.6	1.5	21	11	5.3	.2	3.4	50	28	11	86	6.8	5
Feb. 3	620	32	2.9	.01	8.0	1.6	2.9	1.3	17	11	4.8	.0	3.3	49	27	13	75	6.3	3
Mar. 5	700	32	3.2	.09	7.6	1.5	3.2	2.2	16	10	6.5	.2	3.5	51	25	12	79	6.6	5
Apr. 16	1,400	48	2.9	.02	6.5	1.9	2.0	.8	14	11	2.1	.0	2.3	41	24	13	59	6.7	3
May 12	666	63	1.9	.01	5.8	1.8	1.6	.9	16	8.5	2.8	.0	.8	32	22	9	54	7.3	5
June 4	359	71	2.8	.03	7.6	1.9	3.4	1.5	23	12	4.0	.0	4.9	50	27	8	79	6.6	3
July 14	79	80	3.0	.10	9.2	2.2	4.8	1.5	31	8.5	6.8	.0	.7	54	32	7	94	6.8	3
Aug. 5	103	66	3.1	--	8.0	1.9	4.2	1.3	28	8.5	4.0	.0	2.0	50	28	5	88	7.1	6
Sept. 1	81	81	3.4	.10	8.8	2.0	4.7	1.6	30	7.5	4.9	.0	1.7	53	30	6	94	7.0	6
Average	1,070	51	3.0	.07	7.4	1.8	3.0	1.2	20	10	4.2	.1	1.8	45	26	10	74	--	4
Maximum	10,300	81	4.3	.29	9.2	2.6	4.8	2.2	31	14	6.8	.2	4.9	54	33	14	98	7.5	7
Minimum	74	32	.7	.01	4.8	.8	1.5	.6	6	7.5	1.5	.0	.1	32	16	5	48	6.1	2

Table 10. - Chemical analyses of water from Delaware River at Barryville, 1958 water year

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color
													Calcium, magnesium	Noncarbonate			
Oct. 10, 1957	0.3	0.10	7.0	1.3	1.1	0.4	18	9.4	2.0	0.1	0.3	32	23	8	58	7.0	5
Nov. 12	.6	.06	7.2	1.6	2.1	.7	18	12	3.0	.1	.2	38	25	10	65	6.9	3
Dec. 5	1.9	.15	7.2	1.3	1.5	.9	14	12	3.0	.0	.9	37	24	12	62	6.8	3
Jan. 2, 1958	3.5	--	5.6	1.1	1.2	.6	9	10	2.3	.1	1.1	34	19	11	53	6.9	4
Feb. 6	2.9	.12	6.4	.8	1.7	.6	12	10	3.3	.1	1.2	36	20	10	58	6.3	2
Mar. 5	3.2	.02	6.6	.7	1.7	.8	11	10	3.5	.0	1.3	36	20	11	56	7.1	5
Apr. 18	2.7	.38	5.3	.6	1.2	.9	6	11	1.3	.0	1.7	30	16	11	42	5.8	3
May 6	2.9	.08	4.8	1.1	1.2	.6	10	11	1.0	.1	.5	30	17	9	46	6.0	3
June 4	1.3	.10	6.4	1.0	1.8	1.0	16	9.3	2.5	.0	.6	33	20	7	59	6.2	3
July 16	2.3	.06	7.4	1.3	2.1	1.0	21	8.7	3.0	.1	.0	40	24	7	65	6.6	5
Aug. 1	1.7	.08	7.2	1.4	2.0	.9	18	8.6	2.5	.2	.4	37	24	9	60	6.4	3
Sept. 4	.8	.02	6.4	.9	1.7	.5	15	7.0	3.0	.1	.1	33	20	7	58	6.6	5

Table 11. - Chemical analyses of water from Delaware River at Port Jervis, 1958 and 1959 water years

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Unfiltered	Oxygen consumed: Filtered
Oct. 1, 6, 1957	1,066	--	0.08	--	--	3.2		29	9.5	3.8	--	0.5	--	33	9	82	7.0	5	--	--
Oct. 2-5, 7-10	1,264	1.0	.10	6.9	0.8	1.7	0.9	17	9.3	3.0	0.4	.2	38	21	7	61	6.8	5	4	2
Oct. 11-31	1,389	3.5	.10	7.2	1.4	2.7	.9	22	11	3.1	.1	.1	44	24	6	71	6.8	5	3	3
Nov. 1-4, 6-10	1,199	6.1	.02	7.6	1.8	2.7	.4	23	10	3.0	.1	.7	47	27	8	72	7.2	2	--	--
Nov. 5	1,760	--	--	--	--	--	--	46	--	3.0	--	.8	--	45	8	103	8.2	--	--	--
Nov. 11-30	1,838	3.8	.04	9.6	1.6	2.3	.1	20	12	2.8	.1	.9	44	31	14	70	7.3	2	--	--
Dec. 1-20	3,015	6.8	.13	9.0	1.6	2.7	1.0	24	12	3.1	.1	.8	49	29	10	71	6.8	3	--	--
Dec. 21-31	18,393	7.4	.17	6.0	.9	2.1	.7	10	11	3.0	.2	2.1	44	19	11	59	5.9	7	--	--
Jan. 1-20, 1958	3,985	6.7	.02	7.0	1.4	2.2	.7	15	11	2.2	.1	1.6	45	24	11	67	6.8	2	6	4
Jan. 21-23, 25-31	7,152	4.3	.09	6.4	1.2	2.1	.8	11	13	3.8	.1	1.2	38	21	12	61	6.9	4	4	2
Jan. 24	8,300	--	.02	--	--	7.8		44	15	5.8	--	1.6	--	44	8	108	7.2	--	--	--
Feb. 1-15, 17-20	3,479	4.4	.08	6.4	1.8	1.9	.7	13	12	4.0	.1	1.0	41	24	13	65	6.5	3	--	--
Feb. 21	2,900	--	.10	--	--	73		12	13	112	--	1.3	--	24	14	432	6.3	--	--	--
Feb. 22-28	4,061	3.8	.10	7.2	1.4	2.0	.7	12	12	5.0	.1	1.6	42	24	14	65	6.2	5	--	--
Mar. 1-20	6,838	4.6	.10	6.4	1.0	1.9	.5	13	11	2.9	.1	.2	39	20	10	61	6.7	5	--	--
Mar. 21-31	7,382	4.0	.14	6.4	1.0	2.0	1.1	13	10	3.5	.0	.9	40	20	10	60	6.4	5	--	--
Apr. 1-20	24,345	5.1	.10	6.0	1.2	1.3	.6	11	11	2.1	.1	1.7	37	20	11	52	6.5	5	6	3
Apr. 21-30	13,146	4.0	.08	5.2	1.5	1.2	.7	10	13	1.0	.0	.9	37	19	11	50	6.5	5	--	--
May 1-20	9,548	2.9	.04	6.0	1.0	1.5	.4	12	10	1.8	.1	1.2	35	19	9	51	6.9	3	--	--
May 21-31	4,825	2.0	.08	5.8	.8	1.8	.7	14	8.7	2.0	.0	.5	32	18	7	56	6.7	5	--	--
June 1-17, 19-20	2,925	4.5	.05	6.6	1.5	2.3	.8	18	9.0	2.0	.1	1.2	44	23	8	62	6.7	3	--	--
June 21-22, 24-30	1,777	5.7	.04	7.4	1.5	2.5	.8	22	10	2.7	.1	.7	44	25	7	66	6.5	2	--	--
July 1-20	2,106	5.6	.09	7.6	1.6	2.7	.6	22	12	2.6	.1	1.2	46	26	8	66	6.7	3	5	4
July 21-31	1,797	7.9	.07	7.4	2.0	2.5	1.0	22	10	2.3	.0	.6	46	27	9	68	6.9	8	4	3
Aug. 1-4, 7-20	1,746	6.9	.07	7.4	1.8	2.5	.8	22	12	3.0	.1	1.2	46	26	8	67	6.9	3	--	--
Aug. 21-31	1,620	6.5	.03	7.0	2.8	2.9	.8	24	9.5	2.5	.1	.5	48	29	10	70	7.3	4	--	--
Sept. 1-20	1,598	4.4	.05	7.2	1.1	2.6	.5	22	7.5	3.0	.1	.4	43	23	5	67	7.3	5	--	--
Sept. 21-30	2,598	4.1	.02	7.4	1.5	2.0	.9	21	12	2.2	.0	.2	44	25	8	63	6.9	3	--	--
Time-weighted average	5,365	4.9	.07	7.0	1.4	2.2	.7	18	11	3.1	.1	.9	42	24	9	65	--	4	--	--

Table 11. - Chemical analyses of water from Delaware River at Port Jervis, 1958 and 1959 water years -- continued

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed: Unfiltered	Oxygen consumed: Filtered
Oct. 1-11, 1958	2,061	4.5	0.06	7.0	1.6	2.3	0.7	22	6.0	2.0	0.1	0.0	45	24	6	65	6.7	5	--	2
Oct. 12-15	1,688	--	.05	--	--	4.8		35	10	2.4	--	.0	--	32	4	86	7.8	5	--	--
Oct. 16-31	5,766	4.2	.08	7.2	1.2	2.3	.8	19	10	2.6	.1	.0	44	23	8	67	6.8	5	--	2
Nov. 1-20	6,493	6.1	.02	7.0	1.3	2.0	.8	21	9.7	2.6	.2	.7	40	23	6	61	6.9	3	--	--
Nov. 21-30	5,343	4.9	.03	7.2	1.5	2.0	.6	17	11	2.3	.2	.5	39	24	10	61	6.8	5	--	--
Dec. 1-20	5,042	8.0	.03	7.4	1.6	2.4	.9	20	11	2.2	.2	1.0	49	25	9	63	6.9	5	2	1
Dec. 21-31	2,570	3.7	.21	7.7	1.3	2.3	.9	18	11	3.3	.1	1.2	45	25	10	67	6.7	3	1	1
Jan. 1-15, 1959	2,613	4.2	.02	7.4	1.6	2.5	.7	18	11	3.5	.1	1.0	46	25	10	67	7.1	4	2	1
Jan. 16	2,910	--	.10	--	--	8.7		52	14	3.9	--	.5	--	44	2	112	8.1	5	--	--
Jan. 17-20	2,650	--	.04	--	--	1.6		18	13	3.9	--	1.9	--	32	17	68	6.8	4	--	--
Jan. 21-31	10,639	8.2	.19	6.4	1.4	2.5	1.4	16	9.3	3.0	.2	1.9	50	22	9	61	6.7	5	3	1
Feb. 1-10	4,187	6.2	.06	7.2	1.8	2.5	1.2	18	12	4.2	.1	2.9	51	26	11	68	6.7	6	--	--
Feb. 11-28	4,834	5.9	.05	6.4	1.9	2.9	1.3	16	11	4.0	.1	2.6	45	24	11	65	6.6	4	--	--
Mar. 1-14	5,904	4.7	.04	7.4	1.7	2.1	1.5	16	11	3.8	.0	3.1	48	26	13	62	6.4	4	--	--
Mar. 15-16	4,005	--	.03	--	--	.7		36	10	3.0	--	1.8	--	44	15	92	7.5	--	--	--
Mar. 17-31	8,255	3.5	.04	5.8	1.7	1.7	1.0	13	9.7	2.8	.1	2.9	41	22	11	52	6.3	3	--	--
Apr. 1-10	16,845	6.1	.05	5.6	1.0	3.6	1.0	12	11	2.2	.0	2.9	44	18	8	56	6.6	3	14	2
Apr. 11-12	13,950	--	.08	--	--	1.2		12	11	1.9	--	1.6	--	23	13	53	6.5	--	--	--
Apr. 13	10,800	--	.05	--	--	5.3		37	12	2.0	--	1.6	--	36	6	92	7.5	--	--	--
Apr. 14-20	6,693	5.5	.07	6.3	1.6	2.0	.9	12	12	2.2	.0	1.9	48	22	12	57	6.6	3	5	2
Apr. 21-30	7,373	7.0	.05	6.5	1.3	2.1	1.0	16	12	2.6	.0	1.2	42	22	9	61	6.7	3	11	2
May 1-16	4,781	3.0	.10	6.4	1.8	2.1	1.0	16	10	3.0	.1	.5	38	24	11	58	6.7	5	--	--
May 17	2,380	--	.06	--	--	.7		30	10	3.0	--	.4	--	38	14	81	7.0	5	--	--
May 18-31	2,205	3.1	.08	6.8	2.2	2.3	1.2	18	10	3.5	.1	.5	41	26	11	63	6.7	5	--	--
June 1-3	1,900	--	.02	--	--	1.4		18	9.3	3.0	--	.8	--	26	11	67	6.7	--	--	--
June 4	2,250	--	.01	--	--	7.6		a46	13	2.0	--	.6	--	38	1	102	8.3	--	--	--
June 5-12, 14	1,490	3.7	.00	7.2	2.7	2.4	1.2	19	9.7	3.8	.1	1.5	43	29	14	68	6.6	6	--	--
June 15	1,530	--	.10	--	--	4.6		48	14	1.6	--	1.9	--	48	9	107	7.8	--	--	--
June 16-30	1,760	3.8	.05	6.4	2.6	2.3	1.1	20	10	4.0	.0	1.9	40	27	10	65	6.8	3	--	--
July 1-31	1,655	6.1	.04	9.4	1.4	2.8	.9	22	9.0	3.8	.1	.5	50	30	12	72	6.8	2	--	--
Aug. 1-20	1,628	--	.03	--	--	.9		21	7.3	2.6	--	.2	--	26	9	66	6.8	5	--	--
Aug. 21-28	1,519	--	.04	--	--	2.8		26	7.0	3.0	--	.0	--	27	6	71	7.1	5	--	--
Aug. 29	1,530	--	.10	--	--	8.3		54	7.7	3.3	--	.0	--	39	0	113	8.1	4	--	--
Aug. 30	1,270	--	.11	--	--	.9		17	7.5	2.2	--	.2	--	23	9	58	6.6	5	--	--
Aug. 31	1,440	--	.07	--	--	4.1		44	6.5	3.0	--	.0	--	38	2	98	8.2	6	--	--
Sept. 2-10	1,731	3.9	.05	6.6	1.4	2.4	1.1	20	9.0	2.0	.1	1.1	41	23	6	65	6.6	3	--	--
Sept. 11-16	1,683	4.1	.07	12	2.0	2.7	1.6	34	11	3.0	.1	2.2	66	38	10	86	7.1	12	--	--
Sept. 17-30	1,569	3.3	.05	6.5	1.3	2.2	1.1	21	9.8	1.5	.1	.8	39	22	5	64	6.8	5	--	--
Time-weighted average	4,358	5.0	.06	7.1	1.6	2.4	1.0	20	10	3.0	.1	1.2	45	26	10	65	--	4	--	--

a Includes equivalent of 4 parts per million of carbonate (CO_3).

Table 12. - Chemical analyses of water from Neversink River at Godeffroy, 1958 water year

(Chemical constituents, dissolved solids, and hardness in parts per million)

Date of collection	Mean Discharge (cfs)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids (residue on evaporation at 180°C)	Hardness as $CaCO_3$		Specific conductance (micromhos at 25°C)	pH	Color	Oxygen consumed	
														Calcium, magnesium	Noncarbonate				Unfiltered	Filtered
Oct. 1-10, 1957	69	3.5	0.18	7.2	1.0	2.8	1.0	21	9.6	3.3	0.0	0.9	42	22	5	67	6.4	5	3	2
Oct. 11-31	108	4.2	--	7.8	1.4	3.0	.9	22	9.5	3.8	.1	1.0	50	26	8	72	6.7	12	3	2
Oct. 11-26, 28-31	--	--	.11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nov. 1-10	184	3.3	.04	6.0	1.3	2.2	.5	12	8.5	3.5	.1	1.1	36	21	11	56	6.4	2	--	--
Nov. 11, 13-20	234	3.6	.14	8.0	1.4	2.4	.5	15	11	3.5	.1	1.9	50	26	14	63	6.2	2	--	--
Nov. 12	181	--	--	--	--	--	--	20	--	4.0	--	1.5	--	38	22	83	6.3	--	--	--
Nov. 21-30	147	5.9	.04	8.4	2.0	3.3	.1	24	8.5	3.5	.1	1.8	54	29	10	81	6.3	2	--	--
Dec. 1-3, 5-7, 9-20	261	6.3	.30	8.1	1.7	3.4	1.0	18	14	3.8	.1	2.0	54	27	12	77	6.4	8	--	--
Dec. 21-31	1,531	10	.37	6.0	1.6	3.7	.8	13	11	3.0	.1	1.7	54	22	11	67	6.1	17	--	--
Jan. 1-11, 13-20, 1958	414	4.4	.13	6.4	1.0	2.3	.6	10	12	3.1	.1	1.6	48	20	12	61	6.2	13	--	--
Jan. 22-31	769	4.5	.12	6.1	1.2	2.4	.8	10	13	3.6	.1	1.3	41	20	12	60	6.5	7	6	3
Feb. 1-9, 11-15, 18-20	337	4.8	.07	6.5	1.3	2.7	.7	14	13	3.6	.0	1.4	42	22	10	66	6.5	7	--	--
Feb. 21-28	286	4.8	.23	7.2	1.6	2.6	.7	14	12	5.0	.1	1.2	44	25	13	70	6.2	5	--	--
Mar. 1-19	775	4.5	.20	5.6	1.2	2.6	.6	14	10	3.0	.1	1.0	39	19	8	61	6.7	6	--	--
Mar. 21-28, 30-31	693	2.4	.07	6.4	.9	2.4	.8	10	10	3.5	.0	.9	37	20	12	56	6.7	5	--	--
Apr. 1-20	1,665	4.0	.16	5.0	1.4	1.8	.7	12	10	2.8	.1	1.5	37	19	9	51	6.8	10	7	4
Apr. 21-30	1,358	2.4	.16	4.4	1.2	1.5	.7	9	12	1.0	.1	1.2	35	16	9	44	6.2	7	--	--
May 1-20	1,036	3.1	.11	6.6	1.1	2.1	.6	11	12	1.7	.0	1.6	37	21	12	50	6.5	7	--	--
May 21-31	617	3.5	.15	5.6	.9	2.3	.8	12	8.3	2.7	.0	1.3	37	18	8	52	6.6	5	--	--
June 1-17, 19, 20	259	4.8	.17	6.6	1.4	2.8	.9	19	8.7	3.5	.1	1.7	45	23	7	63	6.7	7	--	--
June 21, 22	170	--	.19	--	--	5.1		23	11	4.3	--	1.6	--	27	8	70	6.5	--	--	--
June 23, 25, 26	154	--	.12	--	--	5.5		40	8.0	4.2	--	.9	--	36	3	98	6.7	--	--	--
June 27-30	148	4.1	.12	7.4	1.2	2.9	.9	19	9.5	4.3	.1	1.3	43	24	8	67	6.7	10	--	--
July 1-7, 9-20	264	5.6	.14	6.4	1.1	3.2	.8	18	8.6	2.8	.1	2.5	45	21	6	63	6.5	7	7	4
July 21, 23-31	166	4.1	.17	6.4	1.4	3.6	1.2	19	9.0	3.3	.0	1.8	43	22	7	68	6.8	8	6	4
Aug. 1-2	145	--	.09	--	--	4.6		25	8.0	4.2	--	.3	--	25	5	75	6.5	--	--	--
Aug. 4	180	--	.09	--	--	10		51	9.5	4.0	--	.2	--	35	0	116	7.4	--	--	--
Aug. 5-9	200	7.0	.06	6.2	1.8	3.9	.7	21	9.5	3.8	.2	.3	46	23	6	70	6.9	--	--	--
Aug. 11-17	190	8.0	.06	6.8	1.7	3.8	.7	22	7.5	4.2	.1	.3	47	24	6	69	6.7	5	--	--
Aug. 18-20	174	--	.06	--	--	.9		15	8.0	3.6	--	.2	--	24	12	56	6.8	--	--	--
Aug. 21-23	322	3.3	.05	5.1	1.8	1.8	.7	14	8.0	1.7	.1	1.0	40	20	9	54	6.8	5	--	--
Sept. 3-20	329	4.4	.08	5.4	.8	2.4	.1	11	8.5	2.8	.1	1.6	33	17	8	54	6.5	7	--	--
Sept. 21-26, 28-29	198	7.0	.05	7.4	2.1	4.1	1.0	22	12	3.6	.0	1.2	50	27	9	74	6.7	3	--	--
Time-weighted average	516	4.7	.14	6.5	1.3	2.7	.7	16	10	3.2	.1	1.4	44	22	9	63	--	7	--	--

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959

Day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
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16									
17									
18									
19									
20									
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
Total									
				February 1957			March		
1				--	--	--	10,200	31	s876
2				--	--	--	8,080	21	458
3				--	--	--	6,750	19	346
4				--	--	--	5,850	12	190
5				--	--	--	4,930		
6				--	--	--	4,370		
7				--	--	--	4,400		
8				--	--	--	4,810	2	25
9				--	--	--	4,700		
10				--	--	--	4,670		
11				--	--	--	4,260		
12				--	--	--	4,300		
13				--	--	--	4,860	4	59
14				3,020	2	16	5,940		
15				3,060	1	8	6,810		
16				2,780	1	8	9,860	31	s914
17				2,240	1	6	10,800	33	962
18				2,620	--	a7	9,130	17	419
19				2,960			8,110		
20				3,150			7,570	4	77
21				2,620	1	7	6,820		
22				2,000			6,140		
23				1,890			5,120		
24				2,060			4,770		
25				2,480			4,820		
26				3,610	13	127	4,730	2	24
27				12,400	127	s5,320	4,740		
28				15,400	112	s5,040	4,380		
29				--	--	--	4,210		
30				--	--	--	3,890		
31				--	--	--	3,620		
Total				62,290	--	10,581	183,640	--	5,100

s Computed by subdividing day
a Computed from partly-estimated concentration graph

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	April 1957 Mean discharge (cfs)	April Suspended sediment Mean concentration (ppm)	April Suspended sediment Tons per day	May Mean discharge (cfs)	May Suspended sediment Mean concentration (ppm)	May Suspended sediment Tons per day	June Mean discharge (cfs)	June Suspended sediment Mean concentration (ppm)	June Suspended sediment Tons per day
1	3,800	1	10	3,900			2,240		
2	4,640	2	25	3,580			2,000		
3	6,900	6	112	3,390	2	17	2,290	3	18
4	6,820	6	110	2,830			2,570		
5	7,160	5	97	2,500			2,350		
6	22,300	213	s18,200	2,670			2,190		
7	34,300	198	s19,800	2,650			2,250		
8	24,300	56	3,670	2,550	2	13	1,880	2	10
9	23,800	43	2,760	2,490			1,540		
10	17,700	21	1,000	2,320			1,470	--	a8
11	13,800	13	484	2,140			1,870		
12	12,400	6	201	1,760			2,030		
13	12,000	8	259	2,560			1,880		
14	10,500	4	113	3,100			2,220		
15	9,180			3,210	2	15	2,190	1	5
16	8,060			3,370			1,660		
17	7,200	5	100	3,140			1,640		
18	6,910			2,390			2,300		
19	6,710			2,260	--	a6	2,390		
20	6,540			4,060	14	153	1,670		
21	5,770			12,600	28	s952	1,560		
22	5,720	8	124	11,400	20	616	1,390		
23	5,790			8,600	16	372	1,320		
24	5,500			7,260	7	137	1,710		
25	5,570			5,400			2,650	2	10
26	5,370			4,390			2,410		
27	5,120	5	67	4,230			2,610		
28	4,260			3,960	2	21	2,200		
29	4,840			3,410			1,760		
30	4,320			2,850			896		
31	--	--	--	2,520			--	--	--
Total	297,280	--	48,282	123,490	--	2,651	59,136	--	296

Day	July Mean discharge (cfs)	July Mean concentration (ppm)	July Tons per day	August Mean discharge (cfs)	August Mean concentration (ppm)	August Tons per day	September Mean discharge (cfs)	September Mean concentration (ppm)	September Tons per day
1	1,210	2	6.7	1,270	1	3.3	946	1	2.6
2	1,280			1,190			966	1	2.6
3	1,230	2	7.1	1,240	.6	2.0	1,480	2	8.0
4	1,400			1,170	2	6.3	2,020	2	11
5	1,480	6	25	1,140	3	9.2	1,690	1	4.6
6	1,610			1,130	2	6.1	1,490	1	4.0
7	1,510	2	8.4	1,100	15	45	1,330	1	3.6
8	1,580			1,130	2	6.1	981	.4	1.1
9	2,330	2	12	1,110	2	6.0	1,010	1	2.7
10	1,940			1,050	2	5.7	1,650	1	4.5
11	1,330	2	7.6	1,020	1	2.8	1,560	1	4.2
12	1,480			1,150	2	6.2	1,460	2	7.9
13	1,700			1,170	2	6.3	1,730	1	4.7
14	1,910	2	10	1,020	1	2.8	1,660	2	9.0
15	1,960			1,170	2	6.3	906	2	4.9
16	1,700	2	7.9	1,070	2	5.8	1,370	1	3.7
17	1,220			969	2	5.2	2,020		
18	1,880	2	10	930	2	5.0	1,480		
19	1,930			1,040	2	5.6	1,440	1	4.4
20	1,750	2	7.8	982	1	2.7	1,640		
21	1,140			1,070	3	8.7	1,600		
22	1,360	2	8.4	1,020	2	5.5	894		
23	1,750			1,010	1	2.7	1,150		
24	1,500	2	7.3	956	2	5.2	1,950		
25	1,200			956	2	5.2	1,730	1	3.6
26	1,190	2	6.5	1,210	2	6.5	999		
27	1,220			1,220	1	3.3	963		
28	1,100	2	6.1	969	2	5.2	1,100	1	2.6
29	1,170			977	.3	.8	828		
30	1,330	2	7.4	1,220	1	3.3	894		
31	1,400			1,010	1	2.7	--	--	--
Total	46,790	--	286.4	33,669	--	190.8	40,937	--	129.5

Total discharge for period February 14 to September 30 (cfs days) - - - - - - - - - - - - - - - - - 847,232
Total load for period February 14 to September 30 (tons) - 67,516.7

s Computed by subdividing day
a Computed from partly-estimated concentration graph

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	October 1957 Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	November Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	December Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day
1	1,310			1,200			2,240		
2	1,290			1,020	1	3.0	2,770		
3	1,170	2	6.4	856			2,600	3	18
4	1,090			1,030			2,320		
5	1,050			1,760			2,100		
6	823			1,630	2	7.6	1,590		
7	840			1,450			1,930		
8	1,690	1	3.4	1,200			2,480	1	7.7
9	1,510			1,450			3,790		
10	1,470			945	1	3.1	4,380		
11	1,260			1,090			4,490	8	97
12	888			1,070			3,860	3	31
13	771	.4	1.1	1,060			3,480		
14	919			1,050	.4	1.4	2,240	2	14
15	1,470			1,650			2,280		
16	1,530			2,470	2	s13	2,710		
17	1,690			2,710			2,790	4	30
18	2,070	1	4.7	2,200	2	12	2,830		
19	1,710			2,020			2,860		
20	1,630			2,440			6,560	24	425
21	1,560			3,390			53,700	491	s69,500
22	1,530			2,680	5	33	32,500	198	s20,300
23	1,370	1	4.0	2,110			16,600	60	s2,690
24	1,430			1,710			11,600	40	1,250
25	1,520			1,620			9,140	44	1,090
26	1,150			1,600	12	48	9,290	24	s587
27	1,230			1,480			23,000	47	s2,980
28	1,460	1	3.5	1,290			17,200	30	s1,460
29	1,520			1,490			11,800	10	319
30	1,160			1,630	3	18	9,480	12	307
31	1,300	1	3.0	--	--	--	8,010	10	216
Total	41,411	--	118.5	49,301	--	535.6	262,620	--	101,542.5

Day	January 1958 Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	February Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day	March Mean discharge (cfs)	Suspended sediment Mean concentration (ppm)	Tons per day
1	7,260	96	a1,880	5,180			7,620	14	288
2	7,490			4,660	15	206	8,990	27	655
3	5,790			4,680			8,420	53	1,200
4	4,930	37	513	4,700			8,660	22	514
5	3,910			4,180	1	11	8,320	30	674
6	3,570			3,970	2	21	7,560	8	163
7	4,230			4,100	2	22	7,260	6	118
8	4,180			3,860	2	21	6,580	11	195
9	3,830	16	151	3,320	1	9.0	6,080	5	82
10	2,820			2,450	3	20	6,090	10	164
11	2,460			3,300	2	18	6,510	10	176
12	2,170			2,800	2	15	6,970	93	1,750
13	2,620			3,100	2	17	6,310	7	119
14	3,180	10	89	3,100	2	17	6,670	11	198
15	4,010			2,700	3	22	6,270		
16	4,560			1,800	--	e9.7	6,100	12	190
17	3,910			1,800	1	4.9	5,890		
18	3,500			2,700	18	131	5,660		
19	2,700	2	17	2,700	58	423	5,340		
20	2,580			2,800	31	234	5,450		
21	3,470			2,900	32	251	5,400	22	301
22	4,060			2,900	32	251	5,310		
23	8,370	14	254	3,000	34	275	4,630		
24	8,300			3,000	40	324	4,580		
25	6,160			3,900	66	695	5,280		
26	7,920	37	791	4,400	26	309	6,020	13	276
27	10,800	40	1,170	5,260	17	241	7,450		
28	9,520	16	411	5,970	31	500	8,510		
29	7,930			--	--	--	9,120		
30	7,100	10	203	--	--	--	10,700		
31	6,190	15	206	--	--	--	14,200	42	s1,660
Total	159,520	--	9,730	99,230	--	4,665.6	217,950	--	12,067

e Estimated
s Computed by subdividing day
a Computed from partly-estimated concentration graph

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	April 1958			May			June		
	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day
1	15,000	97	s3,860	12,000	12	389	2,750		
2	15,500	56	2,340	10,000	8	216	2,840		
3	18,400	121	s5,940	8,980	18	436	3,240	4	32
4	20,900	356	s20,000	11,300	18	549	3,220		
5	22,300	210	as12,700	11,000	14	416	2,900		
6	31,100	559	as49,800	9,180	28	694	2,630		
7	53,900	278	as40,500	9,400	10	254	2,280		
8	46,000	100	12,400	12,500	13	439	2,490	6	39
9	28,600	81	s6,270	13,400	13	470	2,360		
10	20,900	69	3,890	10,900	6	177	2,380		
11	20,700	44	s2,420	9,010	4	97	3,910		
12	21,300	21	1,210	8,510	5	115	3,740		
13	18,200	12	590	8,260	4	89	3,610	6	60
14	19,100	16	825	7,100	4	77	3,670		
15	21,700	29	1,700	6,650	4	72	3,720		
16	24,400	34	s2,290	9,080	18	441	2,980		
17	24,800	25	1,670	9,480	12	307	2,390		
18	23,700	26	1,660	8,050	4	87	2,140	2	13
19	21,700	43	2,520	8,300	4	90	2,110		
20	18,700	26	1,310	7,850	5	106	2,360		
21	16,500	16	713	7,300	5	99	2,270		
22	17,400	17	799	6,430	3	52	1,730		
23	19,200	31	s1,610	5,930	4	64	1,560	2	9.3
24	14,000	15	567	5,470	4	59	1,500		
25	11,100	10	300	4,970	2	27	1,610		
26	9,220	8	199	4,580	2	25	1,780		
27	7,530	5	102	4,430	2	24	1,780		
28	9,310	12	302	4,010	2	22	1,710	2	9.6
29	13,400	29	1,050	3,750	3	30	1,860		
30	13,800	74	2,760	3,180	2	17	1,750		
31	--	--	--	3,030	2	16	--	--	--
Total	618,360	--	182,297	244,030	--	5,956	75,270	--	814.5

Day	July			August			September		
1	1,740			1,610			1,350	2	7.7
2	1,840			1,580			1,350	--	--
3	1,720	2	9.5	1,420			1,320	--	--
4	1,730			1,590	2	9.0	1,280	--	--
5	1,760			1,290			1,270	--	--
6	2,430			1,400			1,240	--	--
7	3,410			1,840			1,300	--	--
8	4,180	8	71	1,850			1,470	2	7.9
9	3,440			1,720			1,860	--	--
10	2,890			1,690			1,820	--	--
11	2,630			2,260	2	11	1,580	--	--
12	1,910	1	5.3	2,360			1,580	--	--
13	1,640			2,030			1,560	--	--
14	1,620			1,700			1,440	--	--
15	1,780			2,070			1,350	1	3.6
16	1,690	2	8.3	2,230	2	9.8	1,320	--	--
17	1,360			1,790			1,400	--	--
18	1,340			1,280			2,430	--	--
19	1,500			1,190			2,800	--	--
20	1,500			1,220			2,230	--	--
21	1,520			1,220	2	7.7	1,800	--	--
22	1,680			1,350			2,300	3	19
23	1,870			1,580			3,770	7	71
24	2,790	2	9.3	1,490			3,080	--	--
25	2,100			1,930			2,610	--	--
26	1,560			2,530	--	--	1,940	--	--
27	1,200			2,070	--	--	2,320	--	--
28	1,190			1,490	--	--	2,590	--	--
29	1,840			1,520	--	--	2,900	4	31
30	2,100	2	9.0	1,450	--	--	2,670	--	--
31	1,920			1,190	--	--	--	--	--
Total	61,880	--	576.2	51,940	--	229.9	57,930	--	140.2

Total discharge for year (cfs days) - - - - - - - - - - 1,939,442
Total load for year (tons) - - - - - - - - - - 318,673

s Computed by subdividing day
a Computed from partly-estimated concentration graph

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	October 1958 Mean discharge (cfs)	October 1958 Suspended sediment Mean concentration (ppm)	October 1958 Suspended sediment Tons per day	November Mean discharge (cfs)	November Suspended sediment Mean concentration (ppm)	November Suspended sediment Tons per day	December Mean discharge (cfs)	December Suspended sediment Mean concentration (ppm)	December Suspended sediment Tons per day
1	2,670			8,180	6	133	6,880		
2	2,940			9,100	2	49	6,250		
3	2,780	--	e33	8,510	4	92	6,320	3	51
4	2,090			12,300	18	598	5,900		
5	1,710			9,670	10	261	5,930		
6	1,740	4	19	8,470	4	91	7,180		
7	1,810			7,140	4	77	7,070		
8	1,730			6,250	4	68	5,780	4	66
9	1,900			5,560	3	44	5,650		
10	1,660	--	e13	5,370			5,090		
11	1,640			5,150			4,590		
12	1,370			5,040			4,230		
13	1,510			4,650	2	26	3,630	4	43
14	1,940	2	10	4,670			3,570		
15	1,930			4,120			3,670		
16	1,820	--	e10	4,070			4,300		
17	1,730			5,100			4,280		
18	1,900			5,210	6	83	2,650	4	34
19	1,620			5,460			3,660		
20	1,510	1	4.1	5,840			3,200		
21	1,830	2	all	5,830			3,110		
22	2,000	2	all	5,130			2,730		
23	2,430	2	all	4,300	2	27	3,500		
24	3,020	2	16	4,600			2,940		
25	3,150	2	17	4,710			1,930	--	e21
26	8,900	56	s1,590	4,630			2,250		
27	15,500	58	s2,460	4,230			2,640		
28	13,900	19	s720	4,080	4	62	1,980		
29	12,000	10	324	7,200			1,930		
30	11,300	6	183	8,720			2,780		
31	9,650	7	182	--	--	--	2,480		
Total	121,680	--	5,864.1	183,290	--	2,447	129,100	--	1,188

Day	January 1959 Mean discharge (cfs)	January 1959 Suspended sediment Mean concentration (ppm)	January 1959 Suspended sediment Tons per day	February Mean discharge (cfs)	February Suspended sediment Mean concentration (ppm)	February Suspended sediment Tons per day	March Mean discharge (cfs)	March Suspended sediment Mean concentration (ppm)	March Suspended sediment Tons per day
1	2,620	1	7.1	5,050	5	68	3,370		
2	1,860			3,510	1	9.5	4,110	14	158
3	2,380			3,760	2	a22	4,450		
4	2,190			3,720	2	a22	4,800		
5	2,200			4,560	2	a22	4,710	16	203
6	3,160			5,530	3	45	8,060	94	bs2,690
7	3,020	--	e14	4,440	2	24	13,400	124	bs4,650
8	3,320			2,900	--	e16	9,380	27	684
9	3,570			2,980	--	e16	6,500	28	491
10	3,270			5,420	14	293	6,020	8	130
11	1,640			10,100			5,210	11	155
12	1,830			7,920			4,880	5	66
13	2,770			5,920			4,180	3	34
14	2,730			5,050	12	205	3,580	4	39
15	2,630	2	15	6,350			3,450	12	205
16	2,910			6,460			4,560	17	209
17	2,860			6,000			7,410	22	440
18	2,070	--	e13	5,540	18	264	6,760	11	201
19	2,300			4,760			5,020	6	81
20	3,370	2	18	4,310			5,770	5	a78
21	3,160	1	a8.5	3,410			10,500	54	bs1,570
22	30,700	229	bs30,800	2,520			10,800	64	s1,840
23	28,700	190	14,700	2,490			8,490	20	458
24	12,730	30	1,030	3,260	--	e139	7,470	14	282
25	8,130	22	483	3,600			7,790	16	337
26	7,660	27	558	3,260			10,100	26	709
27	6,270	6	102	3,070			12,000	40	1,300
28	5,330	6	86	2,990			10,200	18	496
29	4,660	6	75	--	--	--	7,690	14	291
30	4,490	4	48	--	--	--	6,920	15	280
31	5,230	4	56	--	--	--	6,910	4	75
Total	169,730	--	48,224.6	128,080	--	3,898.5	214,490	--	18,626

e Estimated
s Computed by subdividing day
a Computed from estimated concentration graph
b Computed from partly-estimated concentration graph

Table 13. - Suspended-sediment concentration and load in Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	April 1959			May			June		
	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day	Mean discharge (cfs)	Suspended sediment: Mean concentration (ppm)	Suspended sediment: Tons per day
1	9,350	45	1,140	9,120	12	295	1,510	4	17
2	13,700	122	s5,340	7,970	6	129	1,700		
3	37,900	543	as56,000	7,110	14	269	2,490	4	27
4	26,500	156	s11,500	6,490	5	88	2,250	3	18
5	18,300	35	1,730	5,750			2,150		
6	14,400	74	2,880	4,840	4	51	1,580		
7	13,800	16	596	4,420			1,180		
8	11,800	13	414	3,990			1,060		
9	11,100	13	390	3,480			1,240		
10	11,600	52	1,630	3,120			1,570		
11	14,900	31	1,250	3,210	4	36	1,730		
12	13,000	13	456	3,530			1,360		
13	10,800	7	204	3,500			1,490		
14	8,960	12	290	3,390			1,560		
15	7,850	16	339	3,590			1,530		
16	6,630	6	107	2,990	2	16	1,510		
17	5,950	5	80	2,380			1,510	--	e13
18	5,850	6	95	2,640			1,490		
19	5,370	6	87	2,720			1,490		
20	6,240	24	404	2,800			1,510		
21	8,260	17	379	2,980	2	15	1,480		
22	7,180	8	155	2,900			1,730		
23	6,030	4	65	2,250			1,640		
24	5,190	9	126	1,700			1,770		
25	5,060	8	109	1,730			1,900		
26	4,950	10	134	1,810	2	11	2,360		
27	5,700	9	139	2,160			1,890		
28	10,100	16	436	2,520			1,740		
29	11,300	22	s669	2,010			1,940		
30	9,960	16	430	1,320	4	17	2,470		
31	--	--	--	1,330			--	--	--
Total	327,730	--	87,574	109,750	--	1,426	50,830	--	417

Day	July			August			September		
	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day	Mean discharge (cfs)	Mean concentration (ppm)	Tons per day
1	1,810			1,980	--	e9.7	2,100		
2	1,510			1,370	--	e9.7	2,740		
3	1,570			1,310	2	7.1	2,460		
4	1,310			1,330			2,010		
5	1,290			1,580			1,680	--	e9.6
6	1,350			1,730	--	e7.9	1,150		
7	1,310			1,530			1,340		
8	1,360	--	e13	1,190			1,340		
9	1,310			1,390			1,280		
10	1,700			1,720	2	9.3	1,580		
11	2,060			2,260			2,170	10	b59
12	1,640			1,990			2,230	136	819
13	1,480			1,540			1,680	16	73
14	1,210			2,000	--	e9.9	1,170	3	9.5
15	1,510	2	8.2	1,800			1,440		
16	1,410			1,420			1,410		
17	1,280			1,680	2	9.1	1,340		
18	1,410	--	e11	1,900			1,290		
19	1,330			1,620			1,420		
20	1,620			1,230	--	e8.2	1,180		
21	2,920	8	63	1,490			1,170		
22	2,970	6	48	1,750			1,550	--	e13
23	2,370			1,140			1,890		
24	1,880	--	e21	1,140	2	6.2	1,910		
25	1,530			1,240			1,810		
26	997	2	5.4	1,550			1,500		
27	1,300			1,920	--	e8.5	1,020		
28	1,900			1,920			1,170		
29	1,830	--	e9.7	1,530			2,240		
30	2,070			1,270			2,480		
31	2,060			1,440	1	3.9	--	--	--
Total	51,297	--	473.1	48,960	--	262.0	49,750	--	1,264.5

Total discharge for year (cfs-days) - - - - - - - - - - 1,585,487
Total load for year (tons) - - - - - - - - - - 171,664.8

e Estimated
s Computed by subdividing day
a Computed from partly-estimated concentration graph
b Computed from estimated concentration graph

Table 14. - Particle-size analyses of suspended sediment in Delaware River at Port Jervis, 1957 to 1959

(Methods of analysis: B, bottom withdrawal tube; C, chemically dispersed; M, mechanically dispersed; W, in distilled water)

Date of collection	Time	Mean discharge (cfs)	Water temperature (°F)	Suspended sediment												Methods of analysis
				Concentration of sample (ppm)	Concentration of suspension analyzed (ppm)	Percent finer than indicated size, in millimeters										
						0.002	0.004	0.008	0.016	0.031	0.062	0.125	0.250	0.500	1.000	
Dec. 21, 1957.......	1:00 a.m. 7:00 p.m.	53,700	--	484	4,630	11	14	22	32	46	67	89	96	100	--	BWCM
Dec. 22.............	12:30 a.m. 6:30 p.m.	32,500	--	180	616	20	24	37	52	71	84	90	98	99	100	BWCM
Mar. 6, 1959........	4:00 p.m. 4:50 p.m.	10,800	--	104	435	10	25	43	64	77	88	91	98	99	100	BWCM
Mar. 7..............	9:00 a.m. 5:00 p.m.	11,800	40	89	261	21	35	48	64	76	84	89	96	99	100	BWCM
Apr. 2..............	9:00 a.m. 8:30 p.m.	12,600	45	213	727	5	10	14	22	30	43	54	88	95	100	BWCM
Apr. 3..............	4:30 p.m. 5:20 p.m.	39,600	42	621	2,690	8	14	22	31	40	49	56	65	70	100	BWCM
Apr. 3..............	12:15 a.m. 6:30 p.m.	38,500	43	447	1,550	9	17	25	38	52	66	76	88	90	100	BWCM
Apr. 4..............	10:00 a.m. 7:15 p.m.	25,700	43	250	722	7	15	24	37	49	72	87	99	100	--	BWCM

Table 15. - Temperature (°F) of water, Delaware River at Port Jervis, February 1957 to September 1959

Day	October	November	December	January	February 1957	March	April	May	June	July	August	September
1					--	35	48	65	70	66	77	74
2					--	36	45	50	68	73	78	73
3					--	35	--	--	68	75	80	73
4					--	--	--	53	68	78	76	73
5					--	38	40	57	70	76	73	70
6					--	38	40	60	70	78	73	72
7					--	37	40	63	68	79	76	70
8					--	--	40	65	68	80	73	70
9					--	36	39	68	--	78	76	68
10					--	--	41	70	70	70	74	66
11					--	37	45	62	73	75	79	70
12					--	46	--	63	72	70	74	69
13					--	45	35	70	77	--	73	72
14					33	50	41	65	74	74	72	71
15					37	41	39	71	74	76	71	71
16					34	46	47	66	77	72	73	72
17					--	43	48	65	80	76	74	70
18					--	43	50	63	77	78	73	70
19					36	39	53	--	--	72	70	70
20					--	--	59	54	76	80	72	69
21					35	38	60	54	76	82	72	70
22					36	43	62	55	75	82	70	70
23					37	45	69	55	77	77	73	69
24					37	45	61	63	79	77	69	66
25					40	40	58	68	80	76	69	66
26					39	43	65	70	77	77	71	61
27					36	43	65	68	--	77	72	58
28					35	45	68	64	77	76	69	59
29					--	--	68	65	72	75	65	59
30					--	--	63	68	68	80	69	58
31					--	47	--	64	--	80	70	--
Average					--	41	51	63	73	76	73	68

Table 15. - Temperature (°F) of water, Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	October 1957	November	December	January 1958	February	March	April	May	June	July	August	September
1	62	50	38	40	33	35	40	52	73	79	78	70
2	--	53	37	32	35	34	40	52	68	78	78	69
3	56	53	35	31	34	35	41	52	64	78	78	70
4	59	52	37	32	32	35	--	52	68	77	78	72
5	59	51	34	--	35	35	43	50	--	74	--	72
6	57	48	34	--	35	35	42	49	69	75	--	74
7	59	52	39	34	35	36	42	48	66	75	--	73
8	60	50	39	31	35	36	40	48	--	74	76	68
9	65	45	38	--	31	--	40	52	68	74	75	68
10	60	42	38	31	34	37	40	55	68	76	76	--
11	55	40	40	32	31	38	40	54	68	76	75	65
12	53	43	33	31	32	35	40	58	68	77	75	67
13	55	40	33	31	31	38	42	57	66	78	76	64
14	--	46	35	--	31	35	45	56	68	73	--	68
15	56	50	35	35	31	35	--	55	66	76	76	70
16	58	45	36	35	--	38	48	55	67	76	76	70
17	55	47	34	31	32	37	48	58	63	74	--	67
18	57	47	35	32	31	38	48	63	--	--	70	68
19	53	50	--	31	31	37	60	65	63	76	70	65
20	52	46	--	31	31	34	55	62	64	75	74	63
21	--	43	--	31	31	34	55	62	64	--	75	63
22	52	42	48	--	32	38	55	60	68	70	75	63
23	56	42	40	33	31	38	55	58	--	72	74	62
24	56	43	40	32	31	40	55	62	68	75	72	65
25	50	40	40	35	31	40	55	62	--	77	72	--
26	50	38	40	35	31	40	55	62	--	80	71	73
27	45	38	37	33	31	40	50	64	69	--	68	65
28	47	37	37	34	31	44	48	68	--	74	70	62
29	50	43	38	--	--	40	--	62	79	78	72	60
30	50	40	37	35	--	44	50	67	76	75	74	60
31	50	--	36	33	--	40	--	66	--	78	78	--
Average	55	45	37	33	32	37	47	58	--	76	74	67

Table 15. - Temperature (°F) of water, Delaware River at Port Jervis, February 1957 to September 1959 -- continued

Day	October 1958	November	December	January 1959	February	March	April	May	June	July	August	September
1	58	48	34	38	35	38	43	--	66	--	79	--
2	62	46	--	35	33	39	45	--	65	--	76	76
3	63	46	37	35	34	38	45	--	67	--	76	75
4	58	47	38	35	38	37	42	56	66	--	74	77
5	61	45	38	33	42	40	45	58	67	--	67	76
6	58	48	35	34	38	42	40	--	68	68	69	77
7	58	47	35	34	34	41	--	64	70	--	73	76
8	57	47	35	34	45	34	--	54	70	--	71	77
9	61	49	35	34	33	35	46	56	76	--	71	80
10	64	45	35	34	32	40	45	65	74	--	74	79
11	68	47	35	35	--	38	43	70	72	--	76	74
12	56	47	35	35	35	34	45	66	74	--	74	68
13	53	48	35	38	32	37	45	65	--	--	77	67
14	52	48	--	33	35	36	45	64	63	--	78	65
15	67	47	36	38	38	36	45	60	63	74	79	62
16	59	50	35	35	40	38	52	58	--	75	81	64
17	56	47	34	37	36	35	56	56	--	77	82	67
18	57	50	34	33	34	33	55	60	--	78	82	62
19	50	49	34	34	--	39	55	60	--	85	79	65
20	55	50	32	37	34	39	53	68	--	81	81	68
21	54	46	--	35	34	38	54	66	--	78	78	66
22	54	46	32	34	34	35	53	68	--	77	79	61
23	57	45	32	35	34	36	52	70	--	75	73	62
24	58	43	34	35	33	36	54	65	--	76	71	60
25	55	40	33	35	35	36	54	66	--	72	75	76
26	50	43	34	--	37	38	57	67	--	74	77	60
27	48	40	--	34	42	40	55	71	--	78	78	58
28	48	40	38	34	41	37	--	74	--	79	78	66
29	48	38	34	--	--	41	50	74	--	80	77	57
30	46	35	35	38	--	40	53	73	--	81	78	60
31	42	--	35	34	--	38	--	72	--	77	76	--
Average	56	46	35	35	36	38	49	65	--	--	79	68

Table 16. - Temperature (°F) of water, Neversink River at Godeffroy, October 1957 to September 1958

Day	October 1957	November	December	January 1958	February	March	April	May	June	July	August	September
1	58	52	38	40	34	34	44	53	74	79	76	--
2	60	53	37	31	34	35	44	56	69	77	78	--
3	56	56	32	34	33	35	45	49	69	76	--	49
4	56	53	--	31	34	34	46	51	67	62	76	48
5	58	51	36	33	34	35	46	51	70	64	72	44
6	57	47	39	35	36	36	45	--	68	70	74	48
7	60	48	41	36	34	35	41	51	69	72	76	42
8	59	45	--	35	34	36	41	49	68	--	76	43
9	64	45	37	34	33	37	42	53	68	72	76	46
10	59	42	39	35	--	37	42	54	68	74	--	50
11	55	42	38	33	32	37	42	57	67	79	75	50
12	54	40	34	--	35	39	44	62	72	78	74	47
13	53	43	35	34	35	36	46	59	64	76	74	48
14	55	45	35	33	35	40	--	56	68	70	76	47
15	55	49	34	36	34	35	57	53	65	78	74	44
16	60	--	38	35	--	41	50	61	66	78	76	--
17	54	51	37	34	--	41	--	62	67	76	78	53
18	66	48	38	35	33	41	57	65	--	73	70	59
19	54	50	40	33	34	40	58	63	65	74	72	69
20	51	50	44	34	34	--	59	64	63	74	69	77
21	52	47	46	--	35	35	61	63	65	73	72	74
22	54	44	48	34	35	37	59	64	64	--	69	68
23	55	42	42	35	36	42	60	64	65	69	68	75
24	61	44	--	34	37	44	59	62	--	78	--	80
25	52	40	38	35	38	43	56	63	69	79	--	77
26	49	40	40	35	37	41	57	66	70	77	--	73
27	45	39	42	35	36	44	53	67	72	76	--	--
28	44	42	37	36	36	44	55	69	70	76	--	72
29	--	44	38	36	--	--	46	67	72	74	--	65
30	48	43	37	37	--	45	50	66	74	75	--	--
31	52	--	38	35	--	43	--	70	--	76	--	--
Average	55	46	38	35	35	39	50	60	68	74	--	58

Table 17. - Chemical analyses of water from wells penetrating different aquifers

(Chemical constituents, dissolved solids, and hardness in parts per million. Analyses by Geological Survey, United States Department of the Interior, except as noted)

Well Number	Date of collection	Water temperature (°F)	Silica (SiO_2)	Iron (Fe)	Manganese (Mn)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Non-carbonate	Specific conductance (micromhos at 25°C)	pH	Color
									Pleistocene sand and gravel											
D 181	May 18, 1949	50	8.5	0.15	--	16	2.8	5.7		52	4.1	4.5	0.0	13	94	51	9	154	7.9	5
D 395	July 22, 1957	58	5.8	.07	0.00	15	2.9	3.9	0.5	62	6.1	.6	.2	.3	64	50	0	112	7.5	5
D 416	July 22, 1957	50	4.7	.07	.04	14	1.7	2.0	.6	42	8.5	1.1	.1	1.6	54	42	8	91	6.8	2
Sv 1[a]	Dec. 21, 1955	--	--	--	--	--	--	--	--	--	--	4.6	.1	2.0	--	70	--	--	7.0	--
Sv 23	July 22, 1957	50	5.1	.07	.00	4.4	1.2	1.2	.5	6	9.0	1.4	.1	3.6	28	16	11	44	5.8	2
Sv 411[b]	Jan. 4, 1957	--	5.0	.10	.10	14	2.9	--	--	34	<30	25	.0	--	80	46	18	--	6.2	--
									Upper Devonian sandstone											
D 102	July 22, 1957	54	7.9	1.6	.00	20	5.0	87	1.3	66	21	126	.2	2.8	308	71	17	579	6.5	12
D 120	July 22, 1957	58	9.4	.12	.38	23	6.3	8.4	.8	99	16	5.1	.2	3.1	118	84	3	206	7.6	3
D 225	May 20, 1949	47	7.8	8.4	--	28	9.6	156		148	5.8	228	.0	.8	491	109	0	958	8.1	15
									Upper Devonian rocks, undifferentiated											
Sv 84	July 23, 1957	62	14	.05	.00	14	4.5	5.0	.5	63	9.5	1.0	.2	2.6	69	54	2	113	7.1	3
Sv 102	July 22, 1957	58	5.4	.07	.00	19	2.6	2.4	1.0	58	8.2	2.6	.0	6.7	80	58	11	133	7.3	2
Sv 452	July 22, 1957	52	11	.57	.00	14	3.8	8.5	1.1	68	6.3	2.0	.1	6.6	82	51	0	138	6.9	3
									Devonian, Hamilton Group											
Sv 100	July 23, 1957	59	9.4	.45	.00	21	4.9	3.3	.4	91	4.9	1.1	.1	.0	88	73	0	151	7.6	4

a Analysis by New York State Department of Health

b Analysis by Columbus Water and Chemical Testing Laboratory, Columbus, Ohio

Table 18. - Data of Wells in the Delaware River Basin

Well No.	Depth (feet)	Diam. (in.)	Water-bearing formation	Yield gpm	Owner and Location
D-102	420	8	Grey sandstone	160	Middletown Milk and Cream Co, Walton
D-120	185	6	Sandstone	--	E. S. Ramburg, Hancock
D-181	70	8	Gravel	110	McIntosh Slaughter House, Bloomville
D-225	86	6	Red sandstone	3	L. E. Gray, Sidney Center; 5 miles east of Sidney Center
D-395	113	6	Gravel	--	Charles Conroy, Elk Brook
D-416	153	8	Gravel	80	Long Eddy Water Co., Inc., Long Eddy; 1/2 mile north of Long Eddy
Sv-1	21	8	Sand and gravel	160	Wurtsboro Water Dept., Wurtsboro
Sv-23	40	12	Sand and gravel	215	Stevensville Water District, Stevensville; 1.3 miles northwest of Route 55 at Swan Lake
Sv-84	125	6	Sandstone and shale	30	H. Rebers, Rebers' Hotel, Barryville
Sv-100	195	6	Shale	20	John Sicuro, Westbrookville
Sv-102	150	6	Grey sandstone	35	Hills Villa, Callicoon Center
Sv-411	30	12	Sand and gravel	40	Village of Liberty
Sv-452	400	10	Sandstone and shale	--	Grossinger's Hotel, Liberty